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ABSTRACT

This document, seventh in a series of 11 subvolumes of a handbook prepared to provide training for educational research and development personnel in the development of instructional materials, deals with the task of formulating instructional strategies. The document is organized according to the four sequential steps involved in performing the task. The four steps involve: (a) designing practice of each criterion behavior; (b) designing preparatory practice progressions; (c) planning behavior control; and (d) selecting media appropriate to mode requirements of criterion and preparatory practice. More specific substeps list procedures for performing each step. (PD)

AIR-20241-9/71-RP

A Technology For Developing Instructional Materials

3 HANDBOOK

ED 092509

A. PLAN STUDY OF CRITERION BEHAVIORS

B. COLLECT AND ANALYZE DATA ABOUT CRITERION BEHAVIORS

C. SEQUENCE AND GROUP CRITERION BEHAVIORS

D. STATE CRITERION AND PREPARATORY OBJECTIVES

E. PLAN SIMULATION BASED ON INSTRUCTIONAL AND LOGISTICAL NEEDS

F. DEVELOP DIAGNOSTIC AND EVALUATIVE TESTS

G. FORMULATE INSTRUCTIONAL STRATEGIES

H. PLAN ACCOMMODATION OF INDIVIDUAL DIFFERENCES

I. DEVELOP INSTRUCTIONAL MATERIALS

J. EVALUATE INSTRUCTIONAL MATERIALS

X. INDEX

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VOLUMES IN THIS SERIES

1. USER'S MANUAL
2. ORIENTATION
3. HANDBOOK
   (eleven sub-volumes)
4. WORKBOOK
5. FINAL EXERCISES

FOREWORD

This is one of a series of eleven HANDBOOK sub-volumes which has been prepared to provide training for educational R&D personnel in the development of instructional materials.

The USER'S MANUAL, which accompanies the series, describes the role each volume is designed to play and the sequence recommended for its use in the training process. The user is, therefore, urged to read these instructions before using this or any other separate volume.

ACKNOWLEDGMENTS

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The author is indebted: to Dr. Robert Fitzpatrick for reviewing portions of the series of volumes and for informal discussions concerning several training issues; to Mrs. Zita Glasgow for the first and critical use of this volume; and, not least, to Miss Kathleen Gubala for her tireless preparation of the complex manuscript required by this HANDBOOK.

George L. Gropper
~~Pittsburgh~~ 1973

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STEP G.1

G.1 Design practice of each criterion behavior.

G.1.1 Collect and organize all data concerning each criterion behavior.

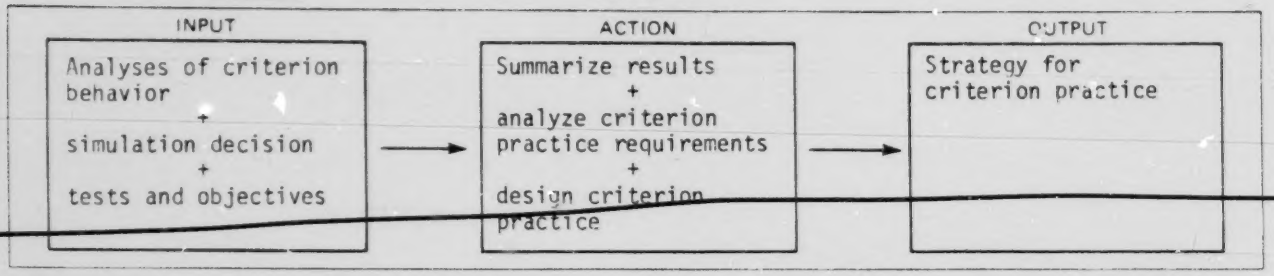
G.1.2 Summarize and record results of learning analyses and performance competency analyses for all the separate SUB-STEPS making up the criterion behavior.

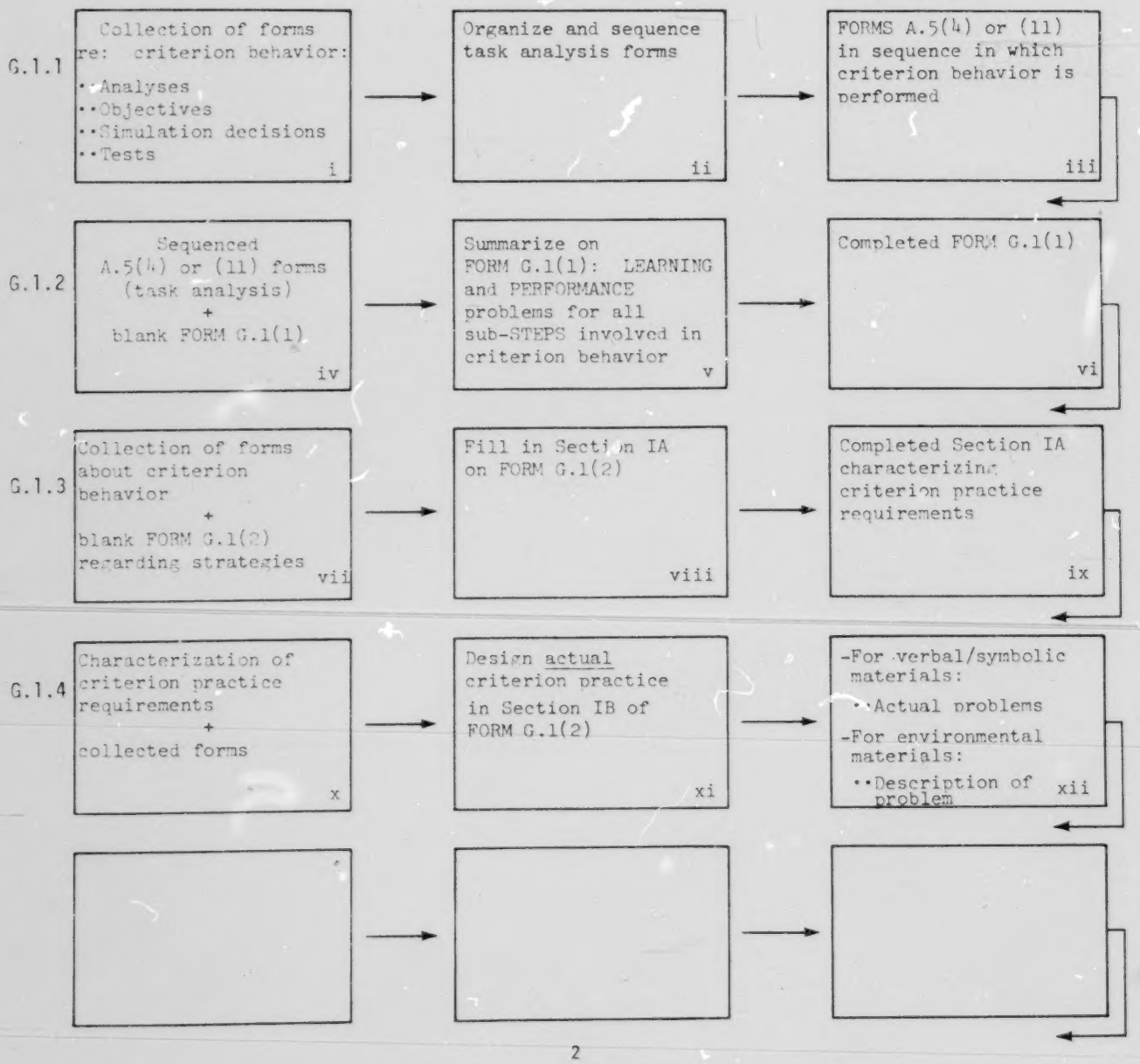
G.1.3 Characterize criterion practice requirements.

G.1.4 Design the actual form in which criterion behavior will be practiced.

STEP G.1

OVERVIEW





STEP G.1

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DESCRIPTION OF Sub-STEP	G.1.1

INPUT	ACTION	OUTPUT
Collection of forms re: criterion behavior: ••Analyses ••Objectives ••Simulation decisions ••Tests i	Organize and sequence task analysis forms ii	FORMS A.5(4) or (11) in sequence in which criterion behavior is performed iii

Job Aid Contents

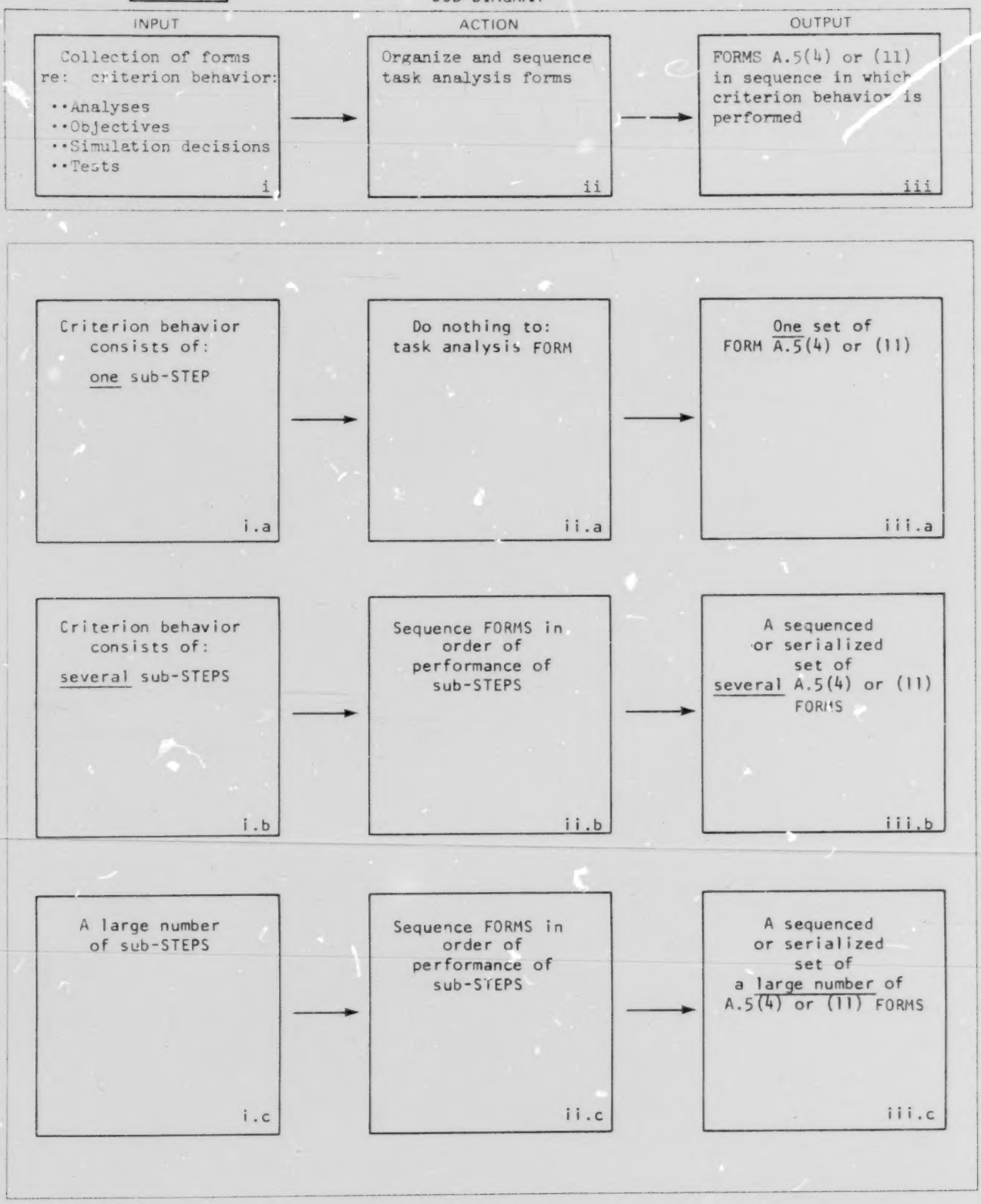
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Variations in size of criterion behavior . . . . 8 -MATRIX: Information available about criterion behavior 9	-MATRIX. How to treat "preparatory" objectives . . 10	-MATRIX: Adequacy of documentation for the criterion behavior 13	SUMMARY OF PROCEDURES . . 12

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		Collection of forms carried forward from	F.4.2	

Sub-STEP G.1.1

JOB DIAGRAM



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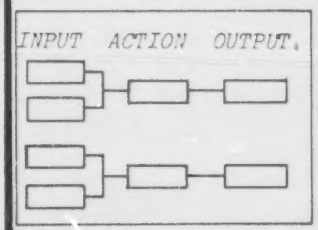
How to treat behavior described in "preparatory objectives"	10

G.1.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING VARIATIONS IN MAGNITUDE OR SIZE OF CRITERION BEHAVIOR

MAGNITUDE VARIATIONS	Criterion behavior consists of ONE sub-step	Criterion behavior consists of SEVERAL sub-steps chained together	Criterion behavior consists of A LARGE NUMBER of sub-steps chained together
CRITERIA	-*The minimal size a criterion behavior can be* -*It includes only one diagrammed set of INPUTS-ACTIONS-OUTPUTS*  *Figure illustrates <u>one</u> sub-step*	-*An intermediate-sized criterion behavior consists of <u>several</u> chained sub-steps* ••*<u>Two</u> to approximately <u>ten</u> sub-steps forming a chain* *Two or more figures, like that in column #1, sequentially ordered*	-*A large-sized criterion behavior consisting of <u>many</u> chained sub-steps* *Ten or more sub-steps forming a chain* *Approximately ten or more figures, like that in column #1, sequentially ordered*
EXAMPLES		e.g., *threading a film projector* e.g., *doing long division* e.g., *classifying chemical elements*	e.g., *doing a task analysis* e.g., *troubleshooting a complex piece of electronic equipment* e.g., *writing a research report*

G.1.1

CRITERIA FOR IDENTIFYING ALL THE DATA AVAILABLE FOR EACH SUB-STEP INVOLVED IN A CRITERION BEHAVIOR

IDENTIFICATION MATRIX	1	2	3	4	5
TYPES OF DATA	-Task description -Task analysis -Learning analysis -Mode analysis -Competency analysis	-Statement of objectives ••Criterion objectives ••Preparatory objectives	-Simulation decision + -Simulation plan (where required)	-Diagnostic and evaluative tests	-Audience analysis based on tryout of tests ••Entering proficiency ••Potential interference ••Residual learning problems
FOR:	Each sub-step	Combined for all the sub-steps making up the criterion	Combined for all the sub-steps making up the criterion	Combined for all the sub-steps making up the criterion	Combined for all the sub-steps making up the criterion
ON FORM #	ALL on FORM A.5(4) or A.5(11) (and any supplementary forms used)	On FORMS D.2(1) and D.2(2)	On FORM E.1(1)	On FORM F.2(1)	NO FORM
PERFORMED DURING	TASK B	TASK D	TASK E	TASK F	TASK F

G.1.1

DECISION MATRIX

DETERMINING HOW TO TREAT BEHAVIOR DESCRIBED IN PREPARATORY OBJECTIVES

CONDITION	You have prepared a statement of a SUB-CRITERION OBJECTIVE	You have prepared a statement of a CRITERION OBJECTIVE
ACTION TO TAKE	-In formulating strategies, treat each sub-criterion objective as if it were a criterion objective, i.e., go through all the same operations described in TASK G -When multiple sub-criterion objectives have been developed for each criterion behavior, develop a strategy for each one of the multiple objectives*	

*See section on STEP G.2 on "sequencing progressions"

EXAMPLES	*The criterion behavior involves identifying the magnitude of a buoyant force--based on the relationships described by the principle of the equality of: (a) the apparent loss of weight of a submerged object; (b) the weight of the displaced water (overflow); and (c) the buoyant force.* *The concepts (a), (b), and (c) are likely to be described in a statement of sub-criterion objectives. In that case, a strategy would be formulated for teaching each concept (i.e., each sub-criterion objective) as well as for teaching the relationships (the criterion objective).*

JOB PROCEDURES

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G.1.1

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN ORGANIZING DATA FOR EACH CRITERION BEHAVIOR

#1

a. Collect all information developed:

-a.1 For each Sub-STEP involved in criterion behavior

··FORM A.5(4) or (11)

-a.2 For the total criterion behavior

··FORM D.2(1) and D.2(2)

··FORM E.1(1)

··FORM F.1(1)

··Audience analysis

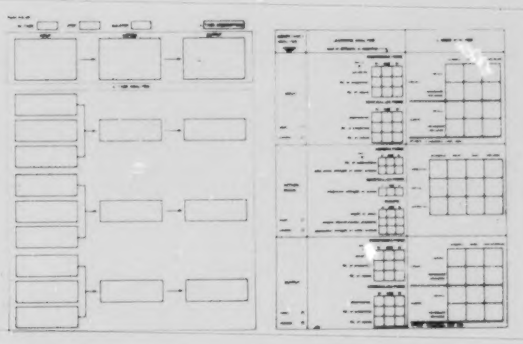
#2

a. Sequence all the separate FORMS: A.5(4) or (11) for separate Sub-STEPS in the sequence in which they are chained (and performed).

The illustration below shows just two forms in sequence for Sub-STEPS #1 and #2. Criterion behaviors would have as many such forms as there are sub-steps making it up.

FORM A.5(4) FOR SUB-STEP #1

FORM A.5(4) FOR SUB-STEP #2



G.1.1

STANDARDS MATRIX

CRITERIA FOR EVALUATING THE ADEQUACY WITH WHICH DATA CONCERNING CRITERION BEHAVIOR HAS BEEN ORGANIZED

PROPERTIES	COMPLETENESS	SEQUENCING
CRITERIA	-*All information concerning criterion behavior has been assembled:* *FOR EACH SUB-STEP* ••*Task description, task analysis, learning analysis, mode analysis, and competency analysis* *COMBINED FOR ALL SUB-STEPS* ••*Statement of objectives* ••*Simulation decision and plan* ••*Diagnostic and evaluative tests* ••*Audience analysis (based on tryout of tests)*	-*Forms (FORM A.5(4) or A.5(11) for each sub-STEP sequenced in the order in which the sub-STEPS are performed (i.e., how they make up a chain)*

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A filled in FORM G.1(1) which summarizes for all the SubSTEPS the criterion behavior both learning problems and performance requirements.*
WHAT YOU WILL WORK FROM	(1) Learning analyses for each SubSTEP identifying learning problems of medium or high judged difficulty. (2) Competency analyses for each SubSTEP identifying whether post-training performance requires recall or transfer.
WHAT YOU WILL DO	(1) Fill in FORM G.1(1) summarizing for each SubSTEP making up the criterion behavior both its learning problems and its performance requirements.
FORMS YOU WILL USE	FORM G.1(1) for summarizing and characterizing the criterion behavior in terms of a dual learning/performance taxonomy.

DESCRIPTION OF Sub-STEP	G.1.2

INPUT	ACTION	OUTPUT
Sequenced A.5(4) or (11) FORMS (task analysis) + blank FORM G.1(1) iv	Summarize on FORM G.1(1): LEARNING and PERFORMANCE problems for all sub-STEPS involved in criterion behavior v	Completed FORM G.1(1) vi

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
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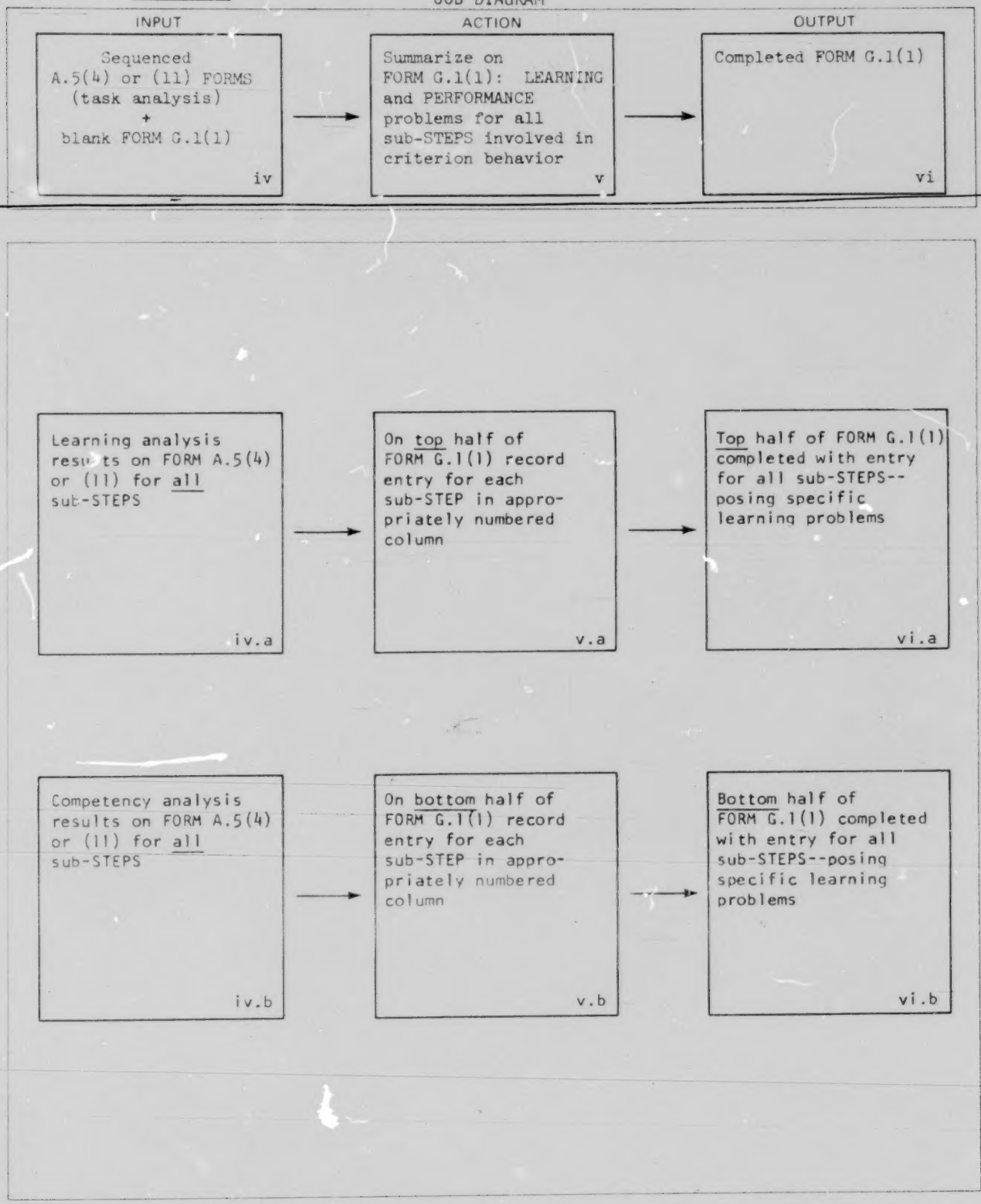
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		Sequenced A.5(4) or (11) forms (carried forward from)	G.1.1	FORM G.1(1)

Sub-STEP G.1.2

JOB DIAGRAM


INPUT
ACTION
OUTPUT
Sequenced A.5(4) or (11) FORMS (task analysis) + blank FORM G.1(1)
iv
Summarize on FORM G.1(1): LEARNING and PERFORMANCE problems for all sub-STEPS involved in criterion behavior
v
Completed FORM G.1(1)
vi
Learning analysis results on FORM A.5(4) or (11) for all sub-STEPS
iv.a
On top half of FORM G.1(1) record entry for each sub-STEP in appropriately numbered column
v.a
Top half of FORM G.1(1) completed with entry for all sub-STEPS--posing specific learning problems
vi.a
Competency analysis results on FORM A.5(4) or (11) for all sub-STEPS
iv.b
On bottom half of FORM G.1(1) record entry for each sub-STEP in appropriately numbered column
v.b
Bottom half of FORM G.1(1) completed with entry for all sub-STEPS--posing specific learning problems
vi.b

BACKGROUND INFORMATION

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Where to get information for filling out FORM G.1(1)	23
Use of FORM G.1(1) is optional, depending on length of chain involved in criterion behavior	24

G.1.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING A DUAL LEARNING/PERFORMANCE TAXONOMY FOR CLASSIFYING CRITERION BEHAVIOR

TYPE OF TAXONOMY	LEARNING taxonomy	PERFORMANCE taxonomy
CRITERIA	-Any criterion behavior can be described in terms of component skills which have to be learned as a prerequisite for performance: Re: INPUTS ••Discriminations ••Generalizations Re: ACTIONS ••Generalizations Re: INPUTS and ACTIONS ••Associations ••Chains -Each criterion behavior has its own combination or configuration of component skills	-Any criterion behavior can be described in terms of post-instructional performance requirements: Re: INPUTS ••Recall ••Transfer Re: ACTIONS ••Recall ••Transfer -INPUTS or ACTIONS which have been experienced during training have to be recalled during performance -INPUTS or ACTIONS which have NOT been experienced during training require transfer during performance -Each criterion behavior has its own combination or configuration of recall and transfer requirements
EXAMPLE learning skills: -discriminations between singular and plural -generalization within each class -associations with verb "to be"	e.g., practiced during instruction bou man house - is tree dog bous men houses - are	e.g., required following instruction GIVEN - STUDENT WILL (saw) - INPUT Requirement man - is - recall dog - is - recall girls - are - transfer flower - is - recall airplanes - are - transfer houses - are - recall cup - is - transfer

G.1.2

IDENTIFICATION MATRIX

	CRITERIA FOR IDENTIFYING THE COMPLETENESS WITH WHICH A CRITERION BEHAVIOR IS CHARACTERIZED IN TERMS OF THE DUAL TAXONOMY	
PROPERTY	INCOMPLETE classification of criterion behavior	COMPLETE classification of criterion behavior
CRITERIA	-*Only the GIVEN in a statement of objectives is classified for learning and performance requirements*	-*All the sub-STEPS which make up the total criterion behavior are classified for learning and performance**
EXAMPLE	e.g., teacher use of "shaping" techniques to increase duration of student persistence at work -*The "given" in a statement of objectives would describe only the variety of problem situations a teacher might encounter; e.g., children persisting at work for different durations (from zero minutes to near the total class time)* -*Only this description is classified for learning and performance requirements*	e.g., teacher use of "shaping" techniques to increase duration of student persistence at work -*The remaining steps or sub-STEPS in the performance of using "shaping" techniques would be classified for learning and performance requirements (including the responses of students to initial teacher actions, the subsequent actions a teacher would take and the student responses to them, and so on until completion of the entire shaping procedure"*

*The GIVEN in a statement of objectives represents only the first sub-STEP in a total chain

FORM G.1(1) on the next two pages is used to summarize learning and performance requirements for the total criterion behavior.

Form G.1(1)

LESSON [ ] CRITERION OBJECTIVE [ ] SUMMARY OF LEARNING AND PERFORMANCE PROBLEMS

LEARNING

Sub-STEPS in a chain	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	FOR EACH ROW: % of H's/Total No. of Sub-STEPS
Discriminations among INPUTS																					
Generalizations across INPUTS																					
Associations between INPUTS and ACTIONS																					
Generalizations across ACTIONS																					
Chaining a series of associations																					

PERFORMANCE

Sub-STEPS in a chain	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	FOR EACH ROW: % of √'s/Total No. of Sub-STEPS
INPUT recall																					
INPUT transfer																					
ACTION recall																					
ACTION transfer																					

Form G.1(1)

LESSON _____ *CRITERION OBJECTIVE* _____ *SUMMARY OF LEARNING AND PERFORMANCE PROBLEMS*

LEARNING

Sub-STEPS in a chain	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	FOR EACH ROW: % of H's/Total No. of Sub-STEPS
Discriminations among INPUTS																					
Generalizations across INPUTS																					
Associations between INPUTS and ACTIONS																					
Generalizations across ACTIONS																					
Chaining a series of associations																					

PERFORMANCE

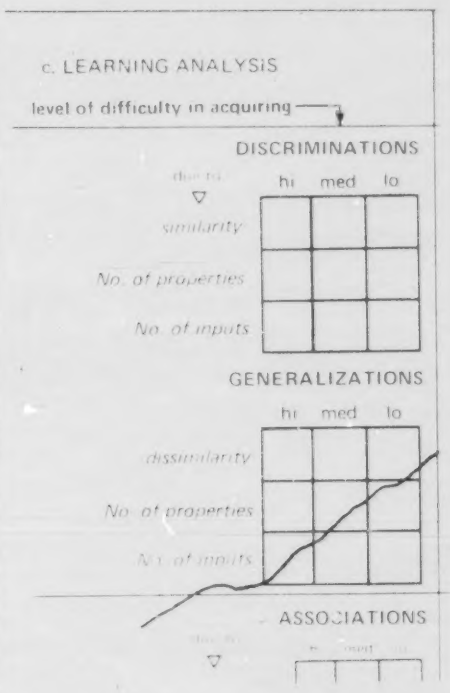
Sub-STEPS in a chain	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	FOR EACH ROW: % of √'s/Total No. of Sub-STEPS
INPUT recall																					
INPUT transfer																					
ACTION recall																					
ACTION transfer																					

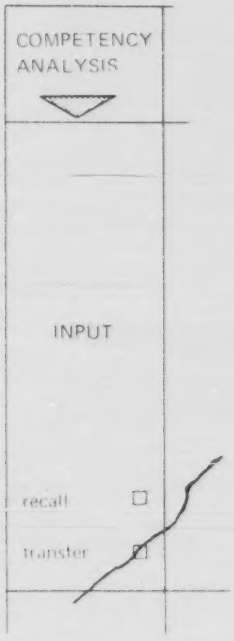
G.1.2 | DETERMINING WHERE TO GET INFORMATION FOR FILLING IN FORM G.1(1)

DECISION MATRIX

CONDITIONS	To be filled in: TOP half of FORM G.1(1), LEARNING requirements	To be filled in: BOTTOM half of FORM G.1(1), PERFORMANCE requirements
ACTION TO TAKE	*For EACH Sub-STEP in the chain that makes up the criterion behavior:* *-Obtain relevant information from: (c) LEARNING ANALYSIS on FORM A.5(4) or (11) for that Sub-STEP* *••Estimates of difficulty for all component skills for that Sub-STEP* *-Repeat for each successive Sub-STEP (getting information from the FORM A.5(4) or (11) associated with it)*	*For EACH Sub-STEP in the chain that makes up the criterion behavior:* *-Obtain relevant information from: COMPETENCY ANALYSIS on FORM A.5(4) or (11) for that Sub-STEP* *••Performance requirements* *-Repeat for each successive Sub-STEP (getting information from the FORM A.5(4) or (11) associated with it)*

ILLUSTRATION WHERE INFORMATION IS OBTAINED





G.1.2 | DETERMINING WHETHER TO USE FORM G.1(2) --ITS USE IS OPTIONAL

DECISION MATRIX

CONDITIONS	Criterion behavior involves few sub-STEPS, approximately five or less	Criterion behavior involves many sub-STEPS, approximately six or more
ACTION TO TAKE	-*Review results of learning and competency analyses on the forms on which they were originally recorded (i.e., FORM A.5(4) or (11)* -*Do NOT transcribe results onto the SUMMARY FORM G.1(1)*	-*Use FORM G.1(1) to summarize the results of learning and competency analyses originally recorded on FORM A.5(4) or (11) for all the sub-STEPS onto one form* -*Make as many entries on FORM G.1(1) as there are sub-STEPS*
EXAMPLES	e.g., *threading a film projector* e.g., *doing long division* e.g., *classifying chemical elements*	e.g., *doing a task anclysis* e.g., *troubleshooting a complex piece of electronic equipment* e.g., *writing a research report*

JOB PROCEDURES

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What information to get for summarizing learning and performance requirements	27
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Adequacy of summary	29

G.1.2

DETERMINING WHAT INFORMATION TO OBTAIN WHEN SUMMARIZING LEARNING AND PERFORMANCE REQUIREMENTS

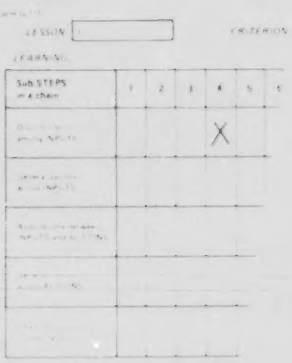
DECISION MATRIX

TYPE OF SUMMARY	LEARNING requirements	PERFORMANCE requirements
ACTION TO TAKE	*FOR EACH SUB-STEP in the chain:* *-Identify all the skills you have rated as "hi" in difficulty to learn** *-Enter an X on FORM G.1(1) (the top half)* *Under the number corresponding to the number of the sub-STEP in the sequence making up the chain* *AND* *Next to the type of skill estimated to be difficult to learn* *DO THIS FOR ALL SUB-STEPS*	*FOR EACH SUB-STEP in the chain:* *-Identify recall or transfer requirements for INPUTS and for ACTIONS* *-Enter an X on FORM G.1(1) (the bottom half)* *Under the number corresponding to the number of the sub-STEP in the sequence making up the chain* *AND* *Next to the type of requirements for that sub-STEP* *DO THIS FOR ALL SUB-STEPS*

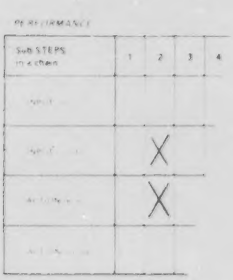
*The user may wish to record an X either for a "hi" estimate alone or for either a "hi" or "med" difficulty estimate. Since there is subjectivity involved in estimating learning difficulty, the user may wish to be on the safe side and record an X for a "medium" or for a "high" estimate.

e.g., *discriminations in sub-STEP #4 estimated "hi" in difficulty.*

*This estimate is recorded below.***



e.g., *INPUT transfer and ACTION recall requirements for sub-STEP #2*



**The rest are left blank so as to illustrate the #4 entry; normally, there would be an entry for any sub-step for which there were "hi" estimates.

G.1.2

ILLUSTRATION SUMMARIZING PROCEDURES FOR SUMMARIZING LEARNING AND PERFORMANCE REQUIREMENTS

#1

For Sub-STEP #1

a. On FORM A.5(4) or (11) - Part c, "learning analysis," - identify learning problems rated hi (or med) in difficulty

b. Record an X on FORM G.1(1) - Sub-STEP #1 - for each problem rated hi or med

c. On FORM A.5(4) or (11), identify recall/transfer requirements

d. Record an X on FORM G.1(1) - Sub-STEP #1 - for recall/transfer requirements

#2

For Sub-STEPS #2, #3, #4, etc.

-Repeat procedures shown in column #1 (to the left)

#3

For the DISCRIMINATION row

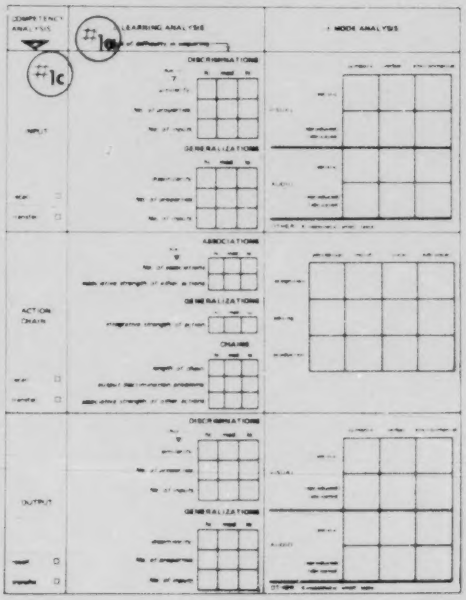
a. Compute the percentage of cells having an X entry

b. Enter the percentage in the last column

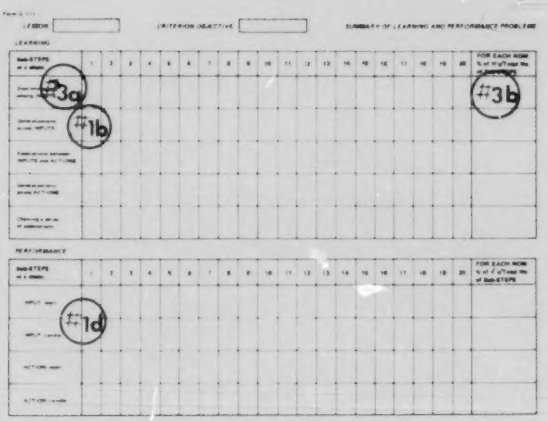
FOR ALL OTHER ROWS:

c. Compute a percentage for each row and enter it in the last column

FORM A.5(4)



FORM G.1(1)



G.1.2

STANDARDS MATRIX

CRITERIA FOR EVALUATING ADEQUACY OF SUMMARIZATION OF LEARNING AND PERFORMANCE REQUIREMENTS

PROPERTIES	I COMPLETENESS	II COMPLETENESS	III COMPLETENESS
CRITÉRIA	-*EACH Sub-STEP is represented by an X (when appropriate)*	-*Learning requirements are represented* -*Performance requirements are represented*	-*A percentage is computed for each row, summarizing the percentage of Sub-STEPS in the total chain:* ••*Possessing hi or medium learning difficulties* *AND* ••*Possessing recall or transfer requirements*

FORM G.1(1) - EXAMPLE - WITH SEVEN Sub-STEPS

Form G.1(1)

LESSON [ ] *CRITERION OBJECTIVE* [ ] *SUMMARY OF LEARNING AND PERFORMANCE PROBLEMS*

LEARNING

Sub-STEPS in a chain	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	FOR EACH ROW: % of H's/Total No. of Sub-STEPS
Discriminations among INPUTS	X						X														$\frac{2}{7}$ = 29%
Generalizations across INPUTS	X				X	X	X														$\frac{4}{7}$ = 57%
Associations between INPUTS and ACTIONS		X				X															$\frac{2}{7}$ = 29%
Generalizations across ACTIONS		X																			$\frac{1}{7}$ = 14%
Chaining a series of associations																					$\frac{0}{7}$ = 00%

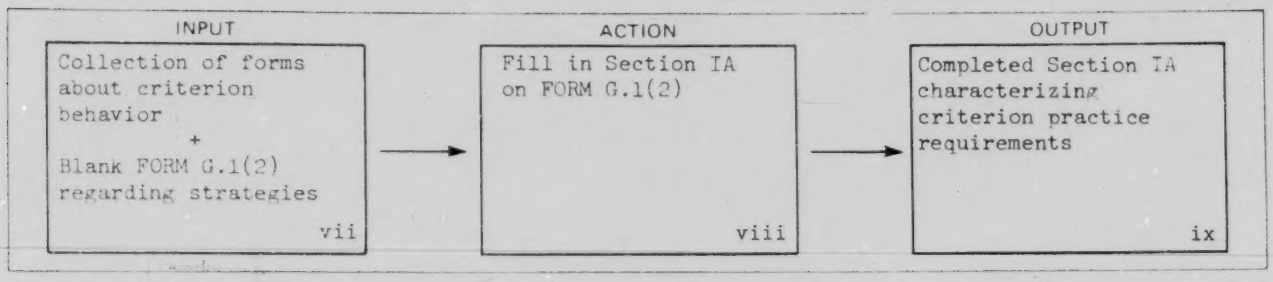
PERFORMANCE

Sub-STEPS in a chain	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	FOR EACH ROW: % of √'s/Total No. of Sub-STEPS
INPUT recall		X	X	X																	$\frac{3}{7}$ = 43%
INPUT transfer	X				X	X	X														$\frac{4}{7}$ = 57%
ACTION recall	X	X	X	X		X															$\frac{5}{7}$ = 71%
ACTION transfer					X		X														$\frac{2}{7}$ = 29%

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A characterization of the predominant: performance requirements, learning problems, and problem source of the total criterion behavior.*
WHAT YOU WILL WORK FROM	(I) The collection of FORMS describing and analyzing all the SubSTEPS in the criterion behavior.
WHAT YOU WILL DO	(I) Fill in section IA of FORM G.1(2).
FORMS YOU WILL USE	FORM G.1(2) for characterizing criterion practice requirements (in section IA).

DESCRIPTION OF Sub-STEP	G.1.3



Job Aid Contents

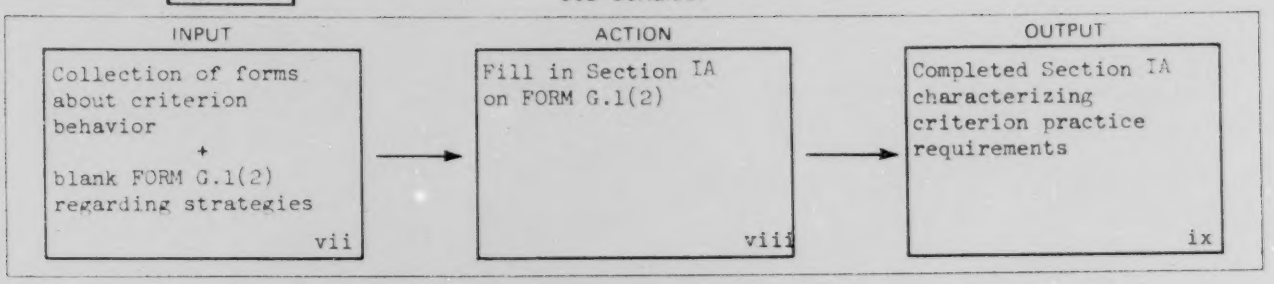
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Information required for characterizing criterion practice requirements . . 39 -MATRIX: Predominant characteristics of criterion behavior 40	-MATRIX: Dealing with learning problems of each sub-STEP vs. predominant learning problem of total criterion behavior . . . 42 -MATRIX: Where to get information for Section IA of FORM G.1(2) . . 43	-MATRIX: Adequacy of characterization of criterion practice requirements . . . 49	FORM G.1(2) SUMMARY OF PROCEDURES . . . 48

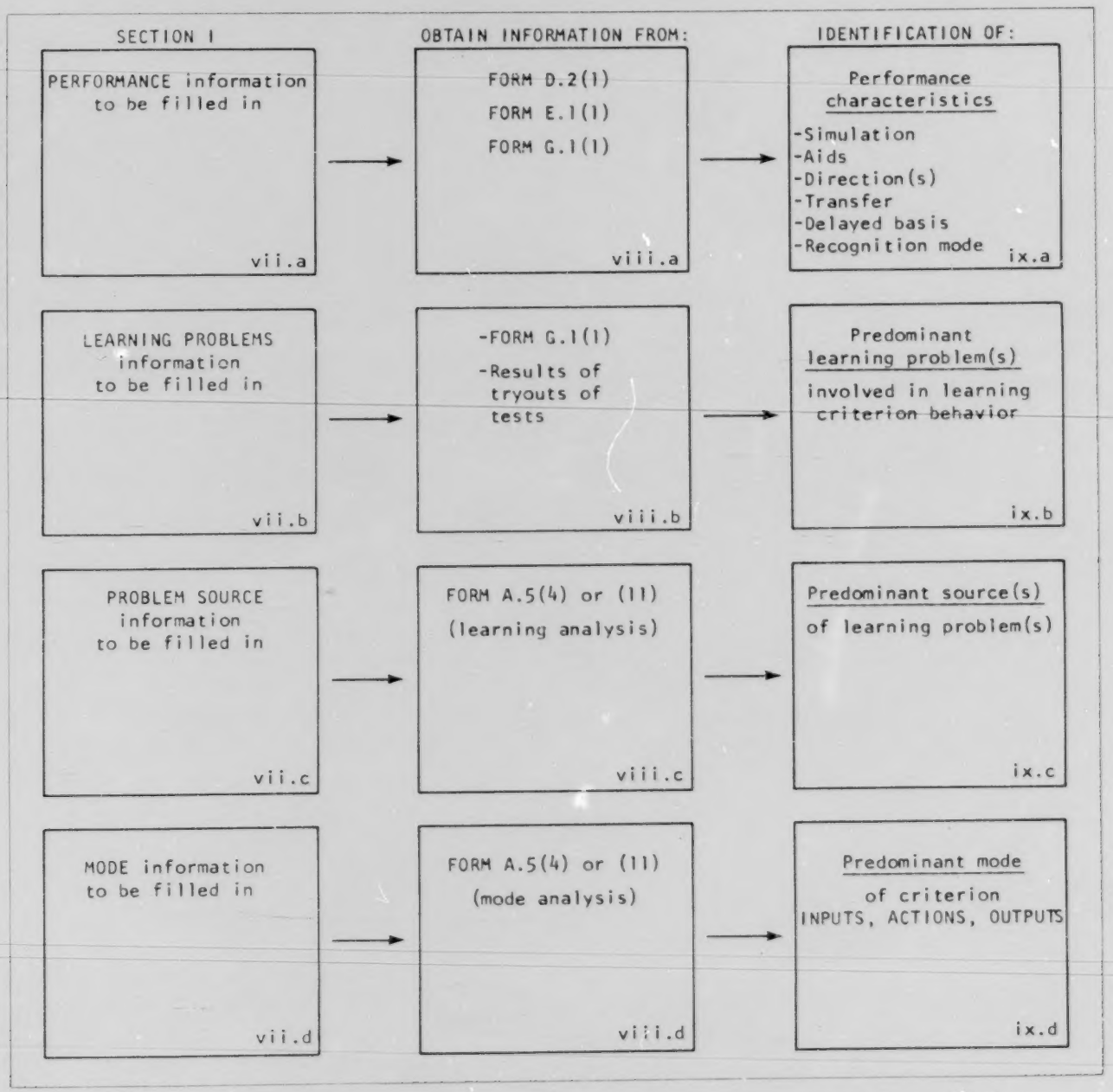
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Results of test tryouts	F.4.2	Collection of forms (carried forward from)	G.1.2	FORM G.1(2)

Sub-STEP G.1.3

JOB DIAGRAM





BACKGROUND INFORMATION

	page
FORM G.1(2) (left-hand side) for characterizing criterion practice requirements (Section IA)	36
Four types of information involved in characterization of criterion practice	39
Identifying the predominant characteristics of criterion behavior	40
How to deal with each Sub-STEP vs. how to deal with the total criterion behavior	42
Where to get information to fill in FORM G.1(2), Section IA, and how to fill it in in order to characterize the criterion behavior	43

FORM G.1(2) in yellow appears on the next four pages.

Before continuing, inspect Section IA: "Characterize Criterion Practice Requirements" on top part of FORM G.1(2) on page 36.

IB. Design Criterion Practice

	GIVEN as INPUT	STUDENT WILL take ACTION	RESULTING IN OUTPUT
EXAMPLE(S) properties of additional examples			

SEE INSIDE PAGES

IIB. Design Preparatory Practice Progression

IIC. Characterize

PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT	MODE
1st				INPUTS OUTPUTS *i* verbal/symbolic *i* *ii* environmental *ii* *iii* audio *iii* *iv* non-realistic *iv* *v* transient *v*
2nd				
3rd				ACTIONS *vi* perceptual *vii* motor *viii* vocal *ix* subvocal

IV. Select Media

INPUT/OUTPUT DISPLAY

r.	print	s.	environmental	t.	devices
r.1	verbal	s.1	people (behavior)	t.1	film, TV
r.2	pictorial	s.2	objects	t.2	slides, projectors
		s.3	events	t.3	simulator
				t.4	audio-tape

	i verbal/symbolic		*ii* environmental			
INPUTS ▼	*iii* audio	visual	*iii* audio	visual		
				v. transient	non-v.	
realistic	s.1		s.2 s.3	s.3	s.1 s.2	
iv non-realistic	t.4	r.1 r.2 t.1 t.2 t.3	t.4	t.1 t.3	t.2 t.3	

ACTION CAPABILITY / RECORD CAPABILITY

performance accommodation		record capabilities	
t.3	simulator	u.	paper and pencil
s.2	objects, equipment (manipulanda)	t.1	film, TV
		t.4	audio tape

OUTPUTS ▶	*i* verbal/symbolic		*ii* environmental			
ACTIONS ▼	iii	iv	iii	iv	v	non-v.
vi & ix	t.4	u		u		
vii		u	t.4	u	t.1	s.2 t.3
viii	t.4					

Form G 1(2)

LESSON ☐ CRITERION BEHAVIOR ☐

IA. Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ simulation ☐ aids available ☐ two directions 1 transfer 2 delayed basis ☐ recognition mode	INPUTS 3 discriminations 4 generalizations INPUTS & ACTIONS 5 associations 6 chains ACTIONS 7 generalizations ☐ partial proficiency	INPUTS A similarity (dis-) B No. of properties C No. of classes (or, No. members/class) INPUTS & ACTIONS D existing associations E length of chain ACTIONS F integrative strength	INPUTS / OUTPUTS i verbal/symbolic i ii environmental ii iii audio iii iv non-realistic iv v transient v ACTIONS vi perceptual viii vocal vii motor ix sub-vocal

IIA. Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a. shaping gradual increases in quantity quality	b. R/E/P c. visual/verbal d. concrete/abstract e. procedures/principles	f. examples or demonstrations g. verbal cues h. visual cues i. diagramming, overviews	j. principles/procedures k. altered criterion/criterion l. errors/criterion m. editing/criterion n. backward chaining	o. repetition p. review q. varied examples

		2	A	B	C	D	E	F	*i*	*vi*	*vii*
1	q	o-p	g	g				q-j	e	h	j
3	b-q	i-o-p	g-h-k	i-g	i					h	
4	b-q	i-o-p	g-h	i-g	i-g				g	h	l
3+4	b-i-q	i-o-p	g-h	i-g	i-g				c-d-e-i		
5	b-o	i-o-p			i-g-o-p	b-g-l					
6	a-f-m-n	o-p					a-n				a-m-n
7	j	o-p						g-h-j			l

IIL. Plan Behavior Control

PROMPT • OBSERVATION • ATTENTION	PROVIDE FEEDBACK	REINFORCE PRACTICE	PROVIDE DELAYED REINFORCEMENT
Advance Organizers statement of objectives instructions *Cues* visual or verbal formats, diagrams checklists	*Correctness of Answers (Solutions)* standard available for comparison discrimination practice re: correct outputs	*Intrinsic Reinforcers* interesting materials *Extrinsic Reinforcers* social monetary activities grades	*Extrinsic Reinforcers* social monetary activities

IB. Design Criterion Practice

	GIVEN as INPUT	STUDENT WILL take ACTION	RESULTING IN OUTPUT
EXAMPLE(S) properties of additional examples			

IIB. Design Preparatory Practice Progression

IIC. Characterize

PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT	MODE
1st				INPUTS OUTPUTS i verbal/symbolic i ii environmental ii iii audio iii
2nd				iv non-realistic iv v transient v ACTIONS vi perceptual vii motor viii vocal ix subvocal
3rd				

IV. Select Media

INPUT/OUTPUT DISPLAY

r.	print	s.	environmental	t.	devices
r.1	verbal	s.1	people (behavior)	t.1	film, TV
r.2	pictorial	s.2	objects	t.2	slides, projectors
		s.3	events	t.3	simulator
				t.4	audio tape

	i verbal/symbolic		ii environmental		
INPUTS ▼	iii audio	visual	iii audio	visual v. transient	visual non-v.
realistic	s.1		s.2 s.3	s.3	s.1 s.2
iv non realistic	t.4	r.1 r.2 t.1 t.2 t.3	t.4	t.1 t.3	t.2 t.3

ACTION CAPABILITY / RECORD CAPABILITY

performance accommodation		record capabilities	
t.3	simulator	u.	paper and pencil
s.2	objects, equipment (manipulanda)	t.1	film, TV
		t.4	audio tape

OUTPUTS ▶	i verbal/symbolic		ii environmental			
ACTIONS ▼	iii	iv	iii	iv	v	non-v.
vi & ix	t.4	u		u		
vii		u	t.4	u	t.1	s.2 t.3
viii	t.4					

Form G 1(2)

LESSON [ ] CRITERION BEHAVIOR [ ]

IA. Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ simulation ☐ aids available ☐ two directions 1 transfer 2 delayed basis ☐ recognition mode	INPUTS 3 discriminations 4 generalizations INPUTS & ACTIONS 5 associations 6 chains ACTIONS 7 generalizations ☐ partial proficiency	INPUTS A similarity (dual) B No. of properties C No. of classes (for, No. members/class) INPUTS & ACTIONS D existing associations E length of chain ACTIONS F integrative strength	INPUTS / OUTPUTS i verbal/symbolic i ii environmental ii iii audio iii iv non-realistic iv v transient v ACTIONS vi perceptual viii vocal vii motor ix sub-vocal

SEE INSIDE PAGES

IIA. Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a. shaping gradual increases in: quantity quality	b. R/E/P c. visual/verbal d. concrete/abstract e. procedures/principles	f. examples or demonstrations g. verbal cues h. visual cues i. diagramming, overviews	j. principles/procedures k. altered criterion/ criterion l. errors/criterion m. editing/criterion n. backward chaining	o. repetition p. review q. varied examples

		2	A	B	C	D	E	F	i	vi	vii
1	q	o-p	g	g				g-i	e	h	i
3	b-q	i-o-p	g-h-k	i-g	i					h	
4	b-q	i-o-p	g-h	i-g	i-g				g	h	i
3+4	b-i-q	i-o-p	g-h	i-g	i-g				c-d-e-i		
5	b-o	i-o-p			i-g-o-p	b-g-i					
6	a-f-m-n	o-p					a-n				a-m-n
7	i	o-p						g-h-i			i

III. Plan Behavior Control

PROMPT • OBSERVATION • ATTENTION	PROVIDE FEEDBACK	REINFORCE PRACTICE	PROVIDE DELAYED REINFORCEMENT
Advance Organizers statement of objectives instructions *Cues* visual or verbal formats, diagrams checklists	*Correctness of Answers (Solutions)* standard available for comparison discrimination practice re: correct outputs	*Intrinsic Reinforcers* interesting materials *Extrinsic Reinforcers* social monetary activities grades	*Extrinsic Reinforcers* social monetary activities

G.1.3

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING FOUR TYPES OF INFORMATION REQUIRED TO CHARACTERIZE CRITERION PRACTICE REQUIREMENTS

TYPES OF INFORMATION	PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCES	MODE
CRITERIA	-*Identification of:* ••*Conditions under which criterion behavior will be practiced* *AND* ••*Performance requirements*	-*Identification of the predominant types of learning problems facing the learner if he is to learn and exhibit the criterion behavior*	-*Identification of the predominant sources of or reasons for the learning problems*	-*Identification of the predominant mode(s) of INPUT, ACTION, and OUTPUT involved in criterion behavior*

EXAMPLES taken from FORM G.1(2)

1A. Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ simulation	INPUTS	INPUTS	INPUTS / OUTPUTS
☐ aids available	☐3 discriminations	☐A similarity (dis.)	☐i verbal/symbolic ☐i
☐ two directions	☐4 generalizations	☐B No. of properties	☐ii environmental ☐ii
☐1 transfer	INPUTS & ACTIONS	☐C No. of classes (or, No. members/class)	☐iii audio ☐iii
☐2 delayed basis	☐5 associations	INPUTS & ACTIONS	☐iv non-realistic ☐iv
☐ recognition mode	☐6 chains	☐D existing associations	☐v transient ☐v
	ACTIONS	☐E length of chain	ACTIONS
	☐7 generalizations	ACTIONS	☐vi perceptual ☐viii vocal
	☐ partial proficiency	☐F integrative strength	☐vii motor ☐ix sub-vocal

G.1.3

IDENTIFICATION MATRIX

CHARACTERIZATION OF BEHAVIOR	CRITERIA FOR IDENTIFYING WHAT MAKES CHARACTERISTICS OF CRITERION BEHAVIOR PREDOMINANT	
	Characteristics of EACH Sub-STEP	Predominant characteristics of the total criterion behavior
	-*Each Sub-STEP in the chain that makes up the criterion behavior has its own characteristics:* ••*Its own performance requirements* ••*Its own learning problems* ••*Its own sources of learning problems* ••*Its own mode*	-*The predominant characteristics of the total criterion behavior depends on what types of Sub-STEPS in the aggregate predominate*
EXAMPLE	e.g., *Sub-STEP #13 in a criterion behavior may have these illustrative requirements* PERFORMANCE: *Transfer* LEARNING PROBLEMS: *Discriminations and generalizations* PROBLEM SOURCE: *Similarity/dissimilarity* MODE: *Verbal* e.g., *Sub-STEP #14 in the same criterion behavior may have these illustrative requirements* PERFORMANCE: *Recall* LEARNING PROBLEM: *Associations* SOURCE OF PROBLEMS: *Number of associations* MODE: *Verbal*	e.g., *there are a total of 22 Sub-STEPS in the illustrative example in the left-hand column (only two were illustrated).* The characteristics found in a majority of the sub-STEPS are what constitutes the predominant characteristics of the criterion behavior. These are: PERFORMANCE: *Transfer and delayed basis* LEARNING PROBLEMS: *Chaining* SOURCE: *Length* MODE: *Verbal*

G.1.3

EXAMPLES ILLUSTRATING CRITERION BEHAVIORS WHICH INVOLVE DIFFERENT PREDOMINANT CHARACTERISTICS

EXAMPLES

TYPES OF PREDOMINANT LEARNING PROBLEMS	DISCRIMINATIONS AND GENERALIZATIONS	ASSOCIATIONS	CHAINS
EXAMPLES	*e.g., concepts and principles in the sciences* *••Species, phyla, orders* *••Types of levers* *••Reinforcement, extinction, punishment* *e.g., decision-making* *e.g., troubleshooting*	*e.g., multiplication products (memorized)* *e.g., learning foreign language equivalents* *e.g., color coding of resistors (ten colors - ten numerical values)*	*e.g., expanding the binominal theorem* *e.g., assembling or disassembling equipment* *e.g., organizing an essay*
**NOTE: While these characteristics predominate in the examples shown, the other learning problems are involved to greater or lesser degrees in each and every sub-STEP.*			

TYPES OF PREDOMINANT PERFORMANCE PROBLEMS	INPUT RECALL	INPUT TRANSFER	ACTION RECALL	ACTION TRANSFER
	e.g., personal pronouns as subjects of sentences *••Singular* *••Plural*	*e.g., nouns as subjects of sentences* *••Singular* *••Plural*	*e.g., poetry recitation*	*e.g., evaluation of a poem*
EXAMPLES	(All are usually encountered in instruction; their appearance in performance of criterion behavior requires RECALL, not transfer; the performer in the criterion situation has to discriminate on a RECALL basis between singular and plural pronouns and to associate on a RECALL basis the appropriate verb form.)	(All are NOT usually encountered in instruction; appearance of new examples in performance of criterion behavior requires TRANSFER. The performer must generalize to new instances of singulars (or to new instances of plurals) on a TRANSFER basis and to associate the right verb form on a TRANSFER basis.)	(Recitation has been previously practiced; identical performance in the criterion situation requires RECALL of the verbal chain.)	(Evaluation is required in the student's own words--or in terms of new criteria he develops; this type of criterion performance requires ACTION TRANSFER.)

G.1.3

DETERMINING HOW TO DEAL WITH THREE CONDITIONS DESCRIBING STATUS OF CRITERION BEHAVIOR

DECISION MATRIX

	1	2	3
CONDITIONS	A sub-STEP in criterion behavior involves component skills which are NOT difficult to learn	A sub-STEP in criterion behavior involves component skills which ARE difficult to learn	CRITERION BEHAVIOR is characterized by a predominant learning problem
ACTION TO TAKE	-*In the instructional sequence (See TASK I) provide practice opportunities for learning these skills*	-*In the instructional sequence (See TASK I) provide practice opportunities for learning these skills*	-*Formulate an instructional strategy (this task, TASK G) to deal with the predominant learning problems posed by the majority of sub-STEPS*
	The instructional sequence must provide practice opportunities to learn the component skills involved in every sub-STEP--whether they are difficult or not		-*The practice of individual sub-STEPS will occur within this overall strategy*

G.1.3

DECISION MATRIX

DETERMINING WHERE TO GET INFORMATION FOR CHARACTERIZING CRITERION PRACTICE REQUIREMENTS AND HOW TO RECORD IT

TO BE FILLED IN	1A Characterize Criterion Practice Requirements

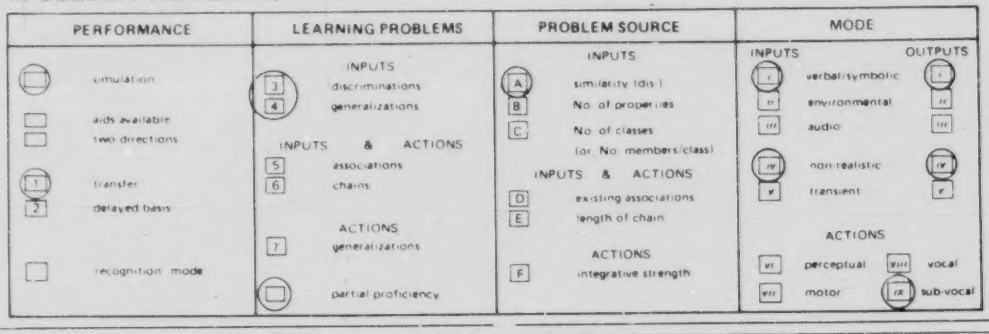
PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
[ ] simulation [ ] aids available [ ] two directions [1] one step [2] delayed basis [ ] recognition mode	INPUTS [3] discriminations [4] generalizations INPUTS & ACTIONS [5] associations [6] chains ACTIONS [7] generalizations [ ] partial proficiency	INPUTS [A] similarity (dis.) [B] No. of properties [C] No. of classes (or No. members/class) INPUTS & ACTIONS [D] existing associations [E] length of chain ACTIONS [F] integrative strength	INPUTS / OUTPUTS [i] verbal/symbolic [i] [ii] environmental [ii] [iii] audio [iii] [iv] non-realistic [iv] [v] transient [v] ACTIONS [vi] perceptual [viii] vocal [vii] motor [ix] sub-vocal

WHERE TO GET INFORMATION	Re: Simulation -FORM E.1(1) Re: Aids available Two directions Delayed basis -FORM D.2(1) (statement of objectives) Re: Transfer -FORM G.1(1) Re: Recognition mode -FORM D.2(1)	Re: Predominant learning problems -FORM G.1(1) Re: Partial proficiency -Results of test tryouts	Re: Predominant problem source -FORMS A.5(4) or (11) for all sub-steps	Re: Predominant mode -FORMS A.5(4) or (11) for all sub-steps *-FORM E.1(1) (simulation) *IF SIMULATION BLOCK IS CIRCLED IN "PERFORMANCE" COLUMN
HOW TO FILL IN	-Circle a square if it applies -Do nothing if it does not apply	-Circle one or more predominant problems which apply -Do nothing to remainder	-Review separate A.5(4) or (11) forms for predominant sources of problems -Circle one or more predominant sources which apply -Do nothing to remainder	-Review separate A.5(4) or (11) forms for predominant mode of INPUT, ACTION, OUTPUT -Circle one or more predominant modes which apply -Do nothing to remainder

G.1.3 | EXAMPLES ILLUSTRATING SECTION IA OF FORM G.1(2) FILLED OUT

EXAMPLE #1

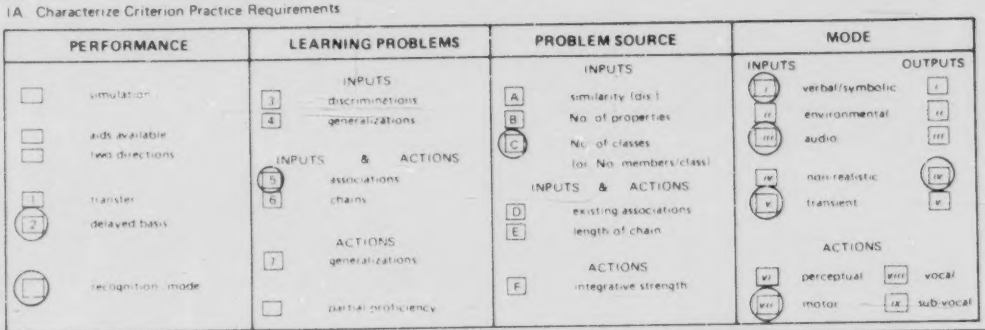
IA Characterize Criterion Practice Requirements



-Simulation is to be used -No aids -Only one direction -Transfer is involved -Performance on a delayed basis is not a concern -The production mode is involved (since "recognition" is not the mode involved)	-The predominant learning problems are: ··Discriminations and ··Generalizations -This is partial proficiency on the part of the learner population	-Similarity/dissimilarity is the key source of the discrimination/generalization problems	-These endorsements reflect a simulation decision -The principal INPUT/OUTPUT mode is verbal -The action is in the sub-vocal mode (e.g., reading, thinking, etc.) -INPUTS and OUTPUTS are non-realistic, verbal (e.g., printed or written words)

EXAMPLE #2

IA Characterize Criterion Practice Requirements



-No simulation is involved -No aids available -Performance is in only one -Only RECALL is required -Delayed RECALL is required -Recognition mode (rather than production) is required	-The predominant learning problem is "association" -No partial proficiency exists	-The predominant source of the problem is the number of inputs and actions to be associated	-INPUT mode is: ··Verbal + audio + transient (i.e., spoken words) -ACTION mode is: ··Motor (i.e., writing) -OUTPUT mode is: ··Verbal + non-realistic (i.e., written words or check marks)

JOB PROCEDURES

	page
What endorsements signify	47
SUMMARY OF PROCEDURES	48
Adequacy of characterization of criterion practice requirements	49

SEE OPPOSITE PAGE:
WAYS TO INTERPRET ENDORSEMENTS IN
SECTION IA OF FORM G.1(2)

1A Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ imitation ☐ aids available ☐ two directions 1 transfer 2 delayed basis ☐ recognition mode	INPUTS 3 discriminations 4 generalizations INPUTS & ACTIONS 5 associations 6 chains ACTIONS 7 generalizations ☐ partial proficiency	INPUTS A similarity (dis-) B No. of properties C No. of classes (or, No. members/class) INPUTS & ACTIONS D existing associations E length of chain ACTIONS F integrative strength	INPUTS / OUTPUTS i verbal/symbolic i ii environmental ii iii audio iii iv non-realistic iv v transient v ACTIONS vi perceptual viii vocal vii motor ix sub-vocal

G.1.3

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING SIGNIFICANCE OF THREE TYPES OF ENDORSEMENTS ON FORM G.1(2)

TYPES OF ENDORSEMENTS	Endorsements indicate: a YES/NO status	Endorsements indicate: an ALTERNATIVE status	Endorsements indicate: which of several ALTERNATIVES is(are) involved
CRITERIA	*-An endorsement indicates that the condition applies* *-The absence of an endorsement indicates that the condition does NOT apply*	*-An endorsement indicates that the condition applies* *-The absence of an endorsement indicates that an ALTERNATIVE (not listed) condition applies*	*-An endorsement indicates which of several listed conditions is applicable* *-The absence of an endorsement indicates that the other listed conditions do not apply*
EXAMPLES	Re: PERFORMANCE Endorsed: YES Not endorsed: NO -Simulation -Aids available Re: LEARNING PROBLEMS -Partial proficiency	Re: PERFORMANCE Endorsed / Not endorsed Two directions / One direction Transfer / Recall Delayed basis / Immediate basis Recognition mode / Production mode Re: MODE iv. Non-realistic / Realistic v. Transient / Non-transient	Re: LEARNING PROBLEMS #3 - #7 Endorsed: Those endorsed are the problem Not endorsed: Those not endorsed are not the problem Re: PROBLEM SOURCE A - F Endorsed: Those endorsed are the source Not endorsed: Those not endorsed are not the source Re: MODE i - iii and vi - x Endorsed: Those endorsed are the mode Not endorsed: Those not endorsed are not the mode

G.1.3

ILLUSTRATION OF PROCEDURES INVOLVED IN CHARACTERIZING CRITERION PRACTICE REQUIREMENTS ON FORM G.1(2)

#1 PERFORMANCE

a. Review FORM E.1(1) for decision whether to simulate:

- a.1 If "yes," circle "simulation" square
- a.2 If "yes," characterize mode of simulation to be used

1b. Review FORM D.2(1) for statement of objectives, and then endorse, as identified, whether:

- 1b.1 Aids available
- 1b.2 Two directions
- 1b.3 Delayed basis
- 1b.4 Recognition mode

1c. Review FORM G.1(1) to see if TRANSFER is predominant performance requirement

- 1c.1 If "yes," circle square for TRANSFER

#2 LEARNING PROBLEMS

a. Review FORM G.1(1) for identification of predominant learning problem(s), and endorse appropriate square(s) on FORM G.1(2)

b. Review test tryout results and endorse square indicating population has partial proficiency at criterion behavior

#3 PROBLEM SOURCE

a. Review the A.5(4) or (11) forms for learning analysis results for all the separate sub-STEPS, and then endorse on FORM G.1(2) the squares indicating the predominant sources of learning difficulties

#4 MODE

a. If "simulation" is NOT endorsed, review mode analysis for all the separate sub-STEPS on A.5(4) or (11) forms, and endorse squares identifying predominant mode of INPUTS, ACTIONS, and OUTPUTS: FORM G.1(2)

SECTION IA (Characterize Criterion Performance Requirements) of FORM G.1(2)

Form G.1(2)

LESSON _____ *CRITERION BEHAVIOR* _____

IA. Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE (#1a.2 or #4a)
☐ simulation (#1a.1)	(#2a) INPUTS: 3 discriminations; 4 generalizations	INPUTS (#3a): A similarity (dis.); B No. of properties; C No. of classes (or, No. members/class)	INPUTS: i verbal/symbolic; ii environmental; iii audio; iv non-realistic; v transient
☐ aids available (#1b.1)	INPUTS & ACTIONS: 5 associations; 6 chains	INPUTS & ACTIONS: D existing associations; E length of chain	OUTPUTS: i verbal/symbolic; ii environmental; iii audio; iv non-realistic; v transient
☐ two directions (#1b.2)	ACTIONS: 7 generalizations	ACTIONS: F integrative strength	ACTIONS: vi perceptual; vii motor; viii vocal; ix sub-vocal
1 transfer (#1c.1)			
2 delayed basis (#1b.3)			
☐ recognition mode (#1b.4)	☐ partial proficiency (#2b)		

G.1.3
STANDARDS MATRIX

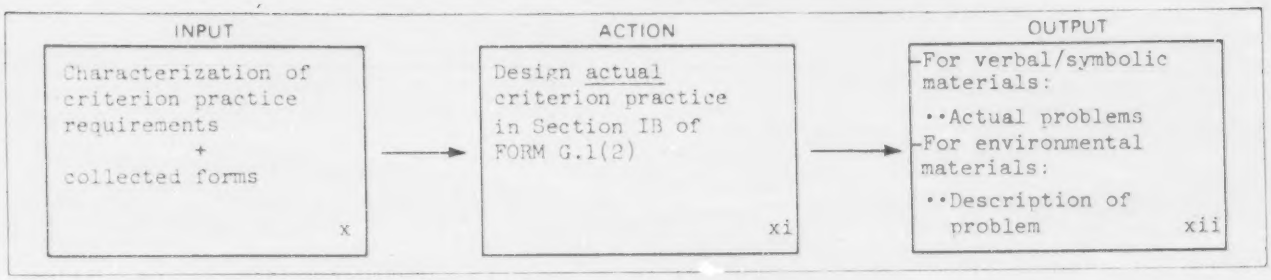
CRITERIA FOR ASSESSING THE ADEQUACY WITH WHICH CRITERION PRACTICE REQUIREMENTS ARE CHARACTERIZED

PROPERTIES	COMPLETENESS	PREDOMINANT CHARACTERISTICS IDENTIFIED
CRITERIA	-*All conditions under PERFORMANCE are considered and systematically receive an endorsement or are purposely left blank* -*Endorsements are made for: LEARNING PROBLEMS, PROBLEM SOURCE, and MODE (See right-hand column)*	-*Endorsements of LEARNING PROBLEMS, PROBLEM SOURCES, and MODE reflect the predominant characteristics of the criterion behavior*

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Descriptions of the actual INPUTS, ACTIONS, and OUTPUTS which will be involved in the practice of the criterion behavior.*
WHAT YOU WILL WORK FROM	(1) Completed section IA of FORM G.1(2): The characterization of performance requirements and learning problems. (2) Group of FORMS from prior analyses.
WHAT YOU WILL DO	(1) Design and describe the form that practice of criterion behavior will assume during training or instruction.
FORMS YOU WILL USE	FORM G.1(2) for describing the form practice of criterion behavior will take (in section IB).

DESCRIPTION OF Sub-STEP	G.1.4



Job Aid Contents

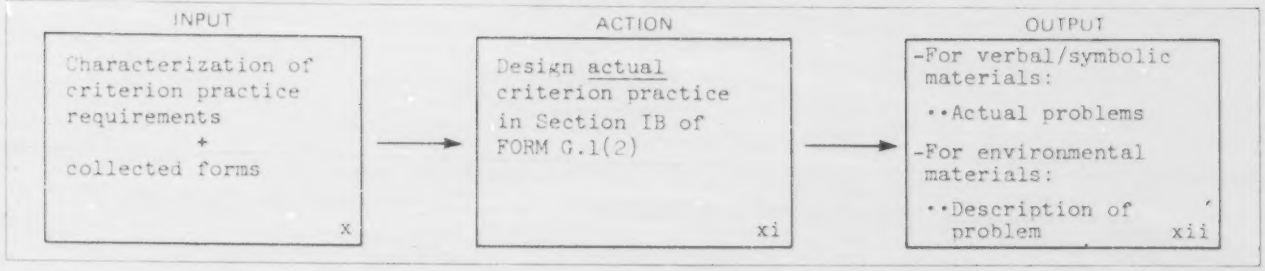
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: What is recorded in Section IB of FORM G.1(2) . . 54, 55	-MATRIX: Where to obtain information as a basis for completing Section IB . . 59	-MATRIX. Adequacy of design of criterion practice 61	FORM G.1(2) SUMMARY OF PROCEDURES . . 60

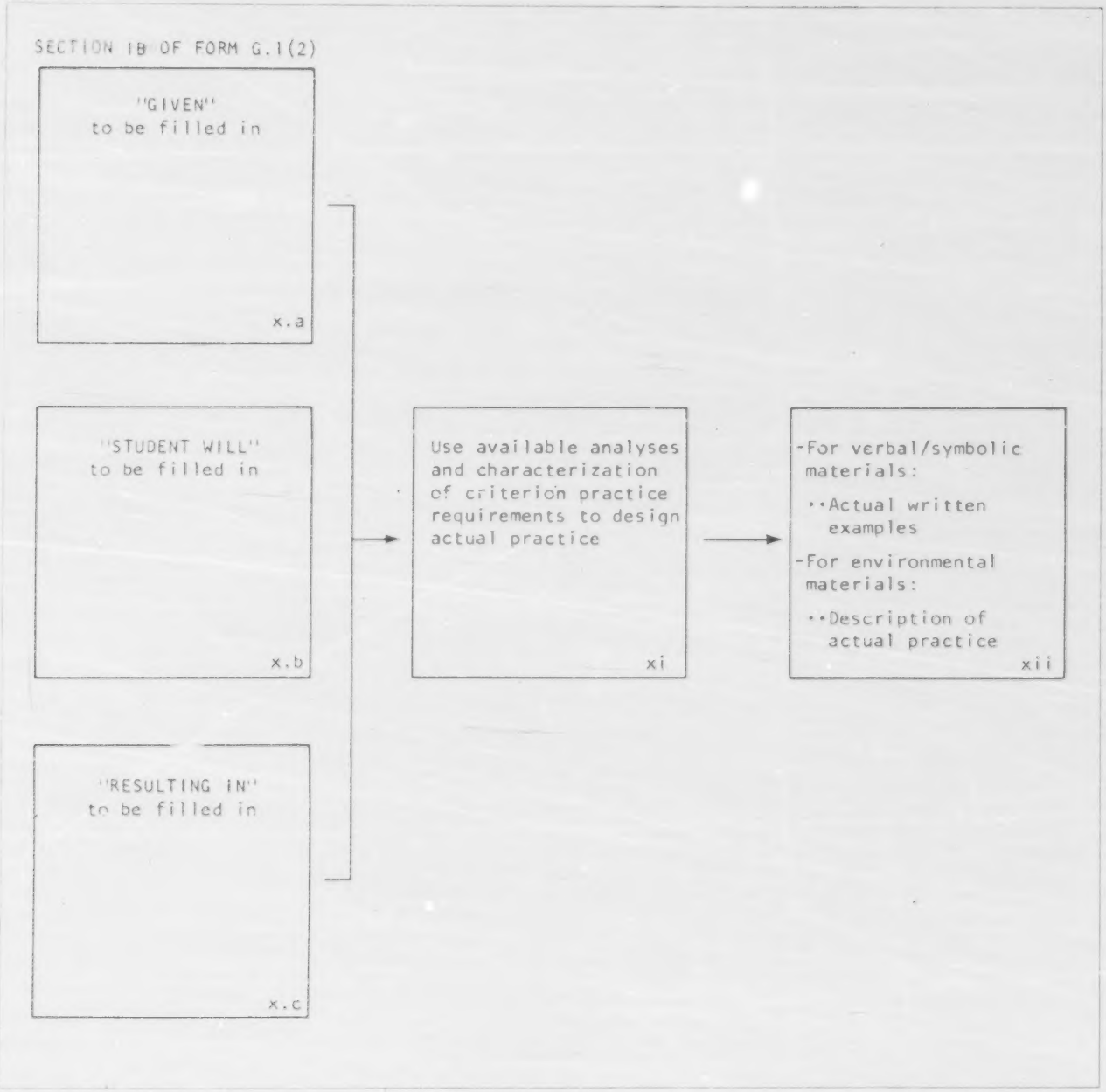
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		Collected forms (carried forward from)	G.1.3	FORM G.1(2)

Sub-STEP G.1.4

JOB DIAGRAM





BACKGROUND INFORMATION

	page
What types of information are recorded in Section IB of FORM G.1(2)	54
What to record	55

G.1.4
IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING WHAT TYPES OF INFORMATION ARE RECORDED IN SECTION IB, "DESIGN CRITERION PRACTICE," OF FORM G.1(2)

PARTS OF SECTION IB	GIVEN as INPUTS	STUDENT WILL take ACTION	RESULTING IN OUTPUT
CRITERIA	-*For CRITERION INPUTS which are VERBAL/SYMBOLIC:* ••*Write out actual INPUTS to be presented to the learner* -*For CRITERION INPUTS which are ENVIRONMENTAL:* ••*Describe what INPUTS will be presented to the learner*	-*For CRITERION ACTIONS which result in VERBAL/SYMBOLIC OUTPUTS:* ••*Write out the series of intermediate outputs (showing the work or method) where this is considered necessary* -*For CRITERION ACTIONS which result in ENVIRONMENTAL OUTPUTS (things, events, or behavior)* ••*Describe the series of intermediate outputs (where this is considered necessary)*	-*For CRITERION OUTPUTS which are VERBAL/SYMBOLIC:* ••*Write out the actual OUTPUT (i.e., answer/solution he is expected to produce* -*For CRITERION OUTPUTS which are ENVIRONMENTAL:* ••*Describe what OUTPUTS he is expected to produce*

EXAMPLE

PLAN INSTRUCTIONAL STRATEGIES

IB Design Criterion Practice

	GIVEN as INPUT	STUDENT WILL take ACTION	RESULTING IN OUTPUT
	e.g., $(x + u)^2$		e.g., $x^2 + 2xu + u^2$
EXAMPLE(S) properties of additional examples	e.g., a list of 10 two-digit numbers to be correlated plus a calculator for raw score computation $\bar{x}$ $\bar{u}$ 17 - 18 15 - 16 19 - 20 etc.	e.g., uses computer to get these values: $\sum x = 70$ $\sum x^2 = 624$ $\sum u = 65$ $\sum u^2 = 533$ and substituting in this formula: $r = \frac{N\sum xu - \sum x \sum u}{\sqrt{N\sum x^2 - (\sum x)^2}\ \sqrt{N\sum u^2 - (\sum u)^2}}$	e.g., a correlation coefficient of $r = .14$

G.1.4
DECISION MATRIX

DETERMINING WHAT TO RECORD IN SECTION IB OF FORM G.1(2)

WHAT TO RECORD	ACTUAL EXAMPLES	PROPERTIES OF ADDITIONAL EXAMPLES
ACTION TO TAKE	-*Enter one or more actual examples of the criterion behavior to be practiced*	-*If criterion practice will involve multiple examples or instances, identify the properties that describe the variations in examples that will be used*

PLAN INSTRUCTIONAL STRATEGIES

IB. Design Criterion Practice

	GIVEN as INPUT	STUDENT WILL take ACTION	RESULTING IN OUTPUT
EXAMPLE(S) properties of additional examples	e.g., *singular and plural nouns* -*Examples:* *man* *houses* *dog* *farms* *women* *trees* -*Other singular or plural examples, with plural examples, form being either regular or irregular*	e.g., *says or writes "is" or "are"*	e.g., *written record of pairings of singular noun and "is," and pairings of plural noun and "are"*

JOB PROCEDURES

	page
Where to get information to be recorded	59
SUMMARY OF PROCEDURES	60
Adequacy of design of criterion practice	61

G.1.4

DECISION MATRIX

DETERMINING WHERE TO GET INFORMATION ON WHICH TO BASE DESIGN OF CRITERION PRACTICE

SOURCES OF AVAILABLE INFORMATION	From Section IA of FORM G.1(2): -Characterization of ••PERFORMANCE ••MODE From FORM D.1(1): -Statement of objectives	From FORM F.1(1) -Criterion test item(s)
ACTION TO TAKE	*For criterion practice involving ENVIRONMENTAL OUTPUTS:* *-Use statement of objectives to obtain information needed to describe criterion practice* *-Use information on FORM G.1(2) to determine simulation mode (where applicable)*	*For criterion practice involving VERBAL/SYMBOLIC OUTPUTS:* *-Use criterion test item or a variation of it as the example of criterion behavior to be practiced* *-Enter items on FORM G.1(2), Section IB*

G.1.4

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN DESIGNING CRITERION PRACTICE

#1

a. Review the following:
   - ··FORM G.1(2): Section IA
   - ··FORM D.2(1): Statement of objectives
   - ··FORM F.2(1): Tests

b. Identify the following:
   - ··What will be GIVEN the student
   - ··What the STUDENT WILL do
   - ··RESULTING IN what

c. Consider use of criterion test item or a variant as the criterion practice to be used

#2

For verbal/symbolic materials

a. Write out actual example of INPUT, ACTION, OUTPUT

For environmental materials

b. Write description of what practice will contain

For BOTH

c. Specify nature of variations in addition to examples to be used

SECTION IB — FORM G.1(2)

PLAN INSTRUCTIONAL STRATEGIES

IB. Design Criterion Practice

	GIVEN as INPUT	STUDENT WILL take ACTION	RESULTING IN OUTPUT
EXAMPLE(S) properties of additional examples	#2a #2b #2c		

G.1.4
STANDARDS
MATRIX

	CRITERIA FOR ASSESSING ADEQUACY OF DESIGN OF CRITERION PRACTICE		
PROPERTIES	FORMAL COMPLETENESS	CONTENT COMPLETENESS	RELEVANCE
CRITERIA	*-An entry provided in each of three columns for:* *••GIVEN* *••STUDENT WILL* *••OUTPUT*	*-An example of criterion practice to be required:* *••Actual verbal/ symbolic example* *••Description of environmental example* *-Identification of properties of other examples to be used*	*-Reflects earlier decisions appearing on:* *••FORM D.2(1): Objectives* *••FORM F.2(1): Tests* *••FORM G.1(2): Section IA*

STEP G.1

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
G.1.1		Collected and organized all data concerning criterion behavior		
G.1.2		Summarized learning and performance requirements for criterion behavior		FORM G.1(1)
G.1.3		Characterized criterion practice requirements		FORM G.1(2) (left half)
G.1.4			Designed actual criterion practice	FORM G.1(2) (right half)

STEP G.2

G.2 Design preparatory practice progressions.

G.2.1 Select preparatory practice progression(s) appropriate to the type(s) of learning and performance problems.

G.2.2 Design examples of preparatory practice progressions.

G.2.3 Characterize the input-action-output mode involved in the designed preparatory practice.

STEP G.2

OVERVIEW

INPUT	ACTION	OUTPUT
Performance requirements + learning problems in meeting the requirements	Plan preparatory practice progressions	Progressions designed to facilitate student progress from: ENTERING BEHAVIOR to CRITERION BEHAVIOR

G.2.1	SECTION IA of FORM G.1(2): -Performance requirements -Learning problems -Problem source -Mode characterization (i)	Enter matrix in SECTION IIA of FORM G.1(2) to select preparatory progressions (ii)	Endorsement of progression(s) suitable to performance and learning problems in Section IIA of FORM G.1(2) (iii)
G.2.2	Descriptions of INPUTS, ACTIONS, and OUTPUTS in criterion behavior + selection of progressions on FORM G.1(2) (iv)	Prepare sample progressions to be used (v)	SECTION IIB of FORM G.1(2) containing actual (or description of) progression (vi)
G.2.3	MODE requirements of: -Criterion behavior AND -Preparatory practice progressions (vii)	Determine differences in requirements; characterize progression MODE requirements (viii)	SECTION IIC of FORM G.1(2) completed (mode requirements) (ix)

PAGE INDEX

	CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
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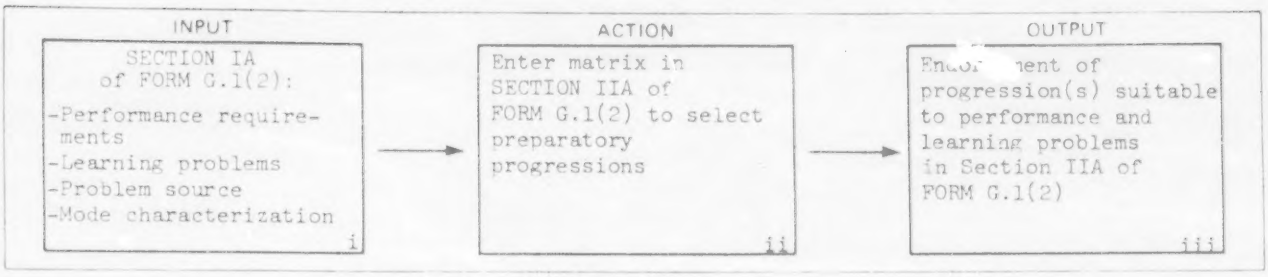
G.2.2	-MATRIX: Combinations of progressions . 124-126 -MATRIX: Progressions for dealing with selected problems . 127-149	-MATRIX: How to fill in SECTION IIB . . 152 -MATRIX: Where to get information for SECTION IIB . . 153	-MATRIX: Adequacy of design of progressions . .155	SECTION IIB of FORM G.1(2) SUMMARY OF PROCEDURES . . . 154
G.2.3	-MATRIX: When criterion and progression modes are likely to differ . . 162	-MATRIX: When to use SECTION IIC of FORM G.1(2) . . 161	-MATRIX: Adequacy of characterization of mode requirements . 165	SECTION IIC of FORM G.1(2) SUMMARY OF PROCEDURES . . . 164

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*The endorsement of preparatory practice progressions (appearing in a selection matrix) which are suitable for the criterion behavior to be taught.*
WHAT YOU WILL WORK FROM	(1) Endorsements in section IA of FORM G.1(2) identifying predominant: ... performance requirements ... learning problems ... problem source(s) ... mode characterizations
WHAT YOU WILL DO	(1) Enter and endorse in the matrix appearing in section IIA of FORM G.1(2) the preparatory practice progressions appropriate to the multiple endorsements previously made in section IA.
FORMS YOU WILL USE	FORM G.1(2) -- section IIA -- a matrix for selecting preparatory practice progressions.

DESCRIPTION OF Sub-STEP	G.2.1



Job Aid Contents

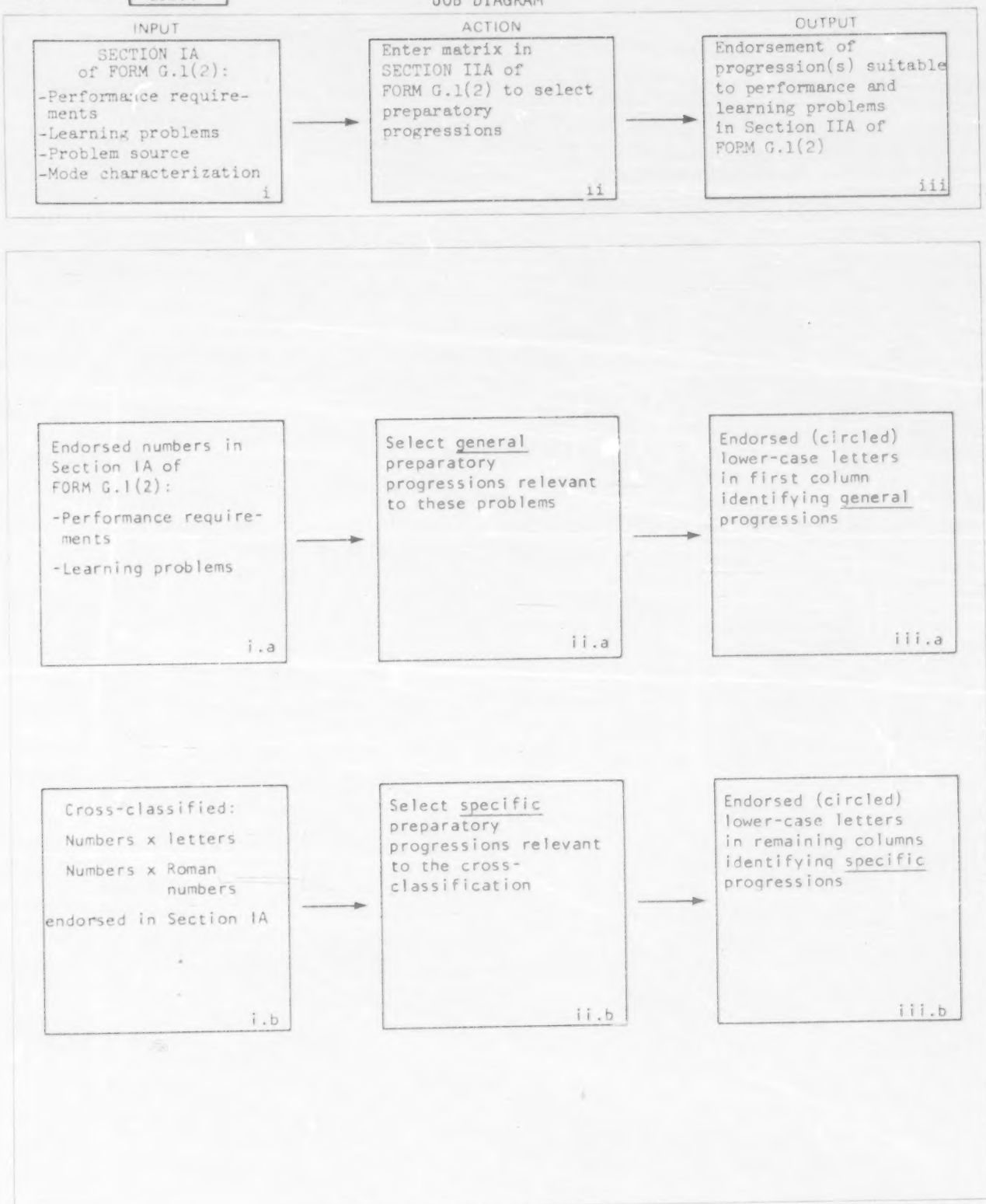
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Purpose and types of preparatory progressions . . 71-114	-MATRIX: How to use SECTION IIA to select progressions . 115-119	-MATRIX: Adequacy of selection of progressions . 121	SECTION IIA of FORM G.1(2) SUMMARY OF PROCEDURES . . 120

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		SECTION IA of FORM G.1(2)	G.1.4	SECTION IIA of FORM G.1(2)

Sub-STEP G.2.1

JOB DIAGRAM



BACKGROUND INFORMATION:

PREPARATORY PRACTICE PROGRESSIONS

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What is the purpose of progressions	73
Five major types of progression	74

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING THE NATURE AND PURPOSE OF BEHAVIOR PRACTICED DURING PREPARATORY PRACTICE PROGRESSIONS

THREE TYPES OF BEHAVIOR	1 ENTERING behavior	2 PREPARATORY PRACTICE behavior	3 CRITERION behavior
CRITERIA	-*Before instruction begins, the learner may be anywhere on a proficiency continuum from zero to 100 percent*	-*The learner is taken from (1) entering behavior to (3) criterion behavior by means of practice during instruction* -*He is aided to bridge the gap between (1) and (3) by engaging in practice that is less demanding than (3); but becomes increasingly and progressively more demanding* -*By proceeding in a carefully designed progression, the learner neither practices errors nor is left behind*	-*After instruction the learner is ideally at 100 percent proficiency in performing the criterion behavior*
EXAMPLES	(1) e.g., *the French student cannot translate a paragraph of scientific material* e.g., *the English student writes paragraphs which are poorly organized*	(2) e.g., *with the aid of a dictionary, the French student practices translating science paragraphs* e.g., *(a) the English student practices selecting which of two or more paragraphs is better organized; THEN, (b) practices editing a poorly organized paragraph*	(3) e.g., *at the end of instruction, the student can translate science paragraphs without a dictionary to the desired range of proficiency* e.g., *finally, the English student writes his own paragraph to an acceptable degree of proficiency*

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING FIVE TYPES OF PREPARATORY PRACTICE PROGRESSIONS
(on this page and on the opposite page)

TYPES OF PROGRESSIONS	1. UNIT SIZE	2. MODE	3. PROMPTING/FADING
CRITERIA	*A progression that starts with:* *-Practice of just part of the criterion behavior (or decreased standards)* *-Proceeds to practice with larger and larger parts (or increasing standards)* *-Ends with all of the criterion behavior practiced (or criterion standards)*	*A progression that starts with:* *-Practice with an INPUT mode or an ACTION mode that is easier than the more difficult mode found in criterion practice* *-Eventually the criterion mode is used*	*A progression that starts with:* *-Practice that is prompted by cues (which are strong enough to elicit correct actions)* *-It continues with gradually weaker cues (fading of cues)* *-And ends with no cues at all (i.e., criterion practice)*
SUB-TYPES	a. Shaping of gradual increases in: ••Quantity or amount of criterion behavior ••Quality of criterion behavior (standards of acceptability)	b. Requiring practice in sequence of: recognition/ editing/production modes Requiring practice responding to: c. Visual examples followed by verbal examples (verbal being the criterion mode) d. Concrete examples followed by abstract examples or by abstract principles (the latter being the criterion mode) e. Practice of procedures followed by practice involving principles about the procedures (dealing verbally with principles being the criterion behavior)	CUES identifying correct performance f. Examples or demonstrations g. Verbal cues ••Rules ••Instructions h. Visual cues i. Diagrams or overviews
EXAMPLES See pages:	77	81	89

G.2.1

IDENTIFICATION MATRIX

CONTINUED: CRITERIA FOR IDENTIFYING FIVE TYPES OF PREPARATORY PRACTICE PROGRESSTONS
(on this page and on opposite page)

TYPES OF PROGRESSIONS	4. CONTENT	5. FREQUENCY or VARIATION
CRITERIA	*A progression that starts with:* *-Practice of something other than the criterion behavior (another type of behavior)* *-And is only then followed by practice of the criterion behavior*	*A progression that starts with:* *-Practice of criterion behavior or progression leading to it* *-Is followed by:* *··Repetition of identical practice* *··Variations in practice examples* *-Concludes with criterion practice*
SUB-TYPES	Requiring practice of: j. Principles about procedures followed by practice of the procedures themselves (procedures being the criterion behavior) k. An altered criterion behavior followed by practice of the unaltered criterion behavior l. Incorrect version of criterion behavior followed by practice of correct criterion behavior m. Editing of a personal record of criterion behavior followed by practice of criterion behavior n. Components of criterion behavior in an altered sequence (backward chaining)	Requiring practice of: o. Repetition of practice prior to criterion practice or of criterion practice itself p. Review of criterion practice following initial training or instruction q. Variations in examples preceding criterion practice
EXAMPLES See pages:	99	109

DISCUSSION OF PROGRESSIONS INVOLVING:

1. UNIT SIZE	page
(a) Shaping	78

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSIONS INVOLVING (a): SHAPING BY GRADUALLY INCREASING SIZE OF PRACTICE UNIT OR BY GRADUALLY REQUIRING HIGHER QUALITY STANDARDS

PROGRESSION (a)	1st in sequence	Intermediate stages in sequence	Final stage in sequence
SHAPING	INITIAL REQUIREMENTS	A SERIES OF INCREMENTS IN REQUIREMENTS	CRITERION BEHAVIOR REQUIREMENTS
CRITERIA: ··Quantity ··Quality ··Time	*-A small part of the criterion behavior is practiced* *-Low standards for criterion behavior are acceptable* *-Small durations of performance are accepted*	*-Gradually, larger and larger parts of the criterion behavior are practiced* *-Gradually, increments in standards are required* *-Gradually, increments in durations of performance are required*	*-Finally, all of the criterion behavior is practiced* *-Final standards are required* *-Final, total duration is required*
RATIONALE	Practice begins with relatively easy demands on the learner; each next stage becomes incrementally but gradually more difficult; finally, the demands are criterion demands.		

EXAMPLES	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING PROGRESSION: (a) SHAPING

EXAMPLES	1st	Intermediate Stages	Final Stage
UNIT SIZE	e.g., student learning long division first learns (practices) only how to estimate the number of units in the dividend the divisor will go;	e.g., then he learns both how to estimate (as in first stage) and determine the number of times the divisor will go into the unit selected;	e.g., finally, he practices all the steps in the long division problem
	e.g., drama student learns just a page of his part	e.g., gradually, he adds additional pages--so that he can act out: 2 pages--then, 3 pages--then, 5 pages	e.g., finally, he can act out his complete part
QUALITY	e.g., student's handwriting is accepted--at minimum neatness (clarity) level	e.g., gradually, progressively more clarity is required in his writing: each increment better than the previous attainment	e.g., criterion standards of neatness/clarity are required
DURATION	e.g., swimmer swims "competitively," i.e., "all out," for 30 seconds at the start	e.g., then swims "competitively" for: 35 seconds, then 40 seconds, then 45 seconds, etc.	e.g., finally, swims "competitively" for 1 minute (the duration required by the event he is in)
	e.g., student persists at work for 10 minutes at the start	e.g., then gradually increases the durations: 15 minutes 18 minutes 21 minutes	e.g., finally, works for 45 minutes, the whole class period

DISCUSSION OF PROGRESSIONS INVOLVING:

2. MODE	page
(b) Recognition/editing/production	82
(c) Visual examples/verbal examples	84
(d) Concrete examples/abstract examples	84
(e) Practice of procedures/verbal principles about procedures	86

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING CHARACTERISTICS OF PROGRESSION (b): (1) RECOGNITION/(2) EDITING/(3) PRODUCTION

PROGRESSION (b)	1st in sequence	2nd in sequence	3rd in sequence
MODE	RECOGNIZE	EDIT	PRODUCE (criterion behavior)
CRITERIA	*-The learner is presented with two or more options of:* *··INPUTS* *··OUTPUTS* *··ACTIONS* *··INPUT-ACTION associations* *··Chains* *-He is required to:* *(1) Select one of the options because:* *··It is correct* *··It is different from the other option* *(2) Indicate whether the options are the same or different* *(3) Match up options which are:* *··Similar, or* *··Go together*	*-The learner is presented with a single option of:* *··INPUTS* *··OUTPUTS* *··ACTIONS* *··INPUT-ACTION associations* *··Chains* *-He is instructed that it is:* *··Incorrect, or* *··Inadequate* *-He is required to:* *··Correct it, or* *··Improve it* *(In effect, to produce the correct or improved alternative)*	*-The learner is presented with:* *··An INPUT* *-He is required to produce:* *··The ACTION associated with it; or* *··The series of associations, i.e., the chain for which it is the initial INPUT*
RATIONALE FOR THE PROGRESSION	It is easiest: merely to have to select a correct option from a set of options than to have to produce an unaided answer.	It is of intermediate difficulty: to be presented with an option or answer which is identified as the wrong one and to be required to correct it.	It is most difficult: to have to produce an answer without any help or clues at all.
EXAMPLES		SEE OPPOSITE PAGE	

G.2.1

EXAMPLES ILLUSTRATING PRACTICE PROGRESSIONS INVOLVING MODE VARIATIONS: RECOGNITION/EDITING/PRODUCTION

EXAMPLES	1st RECOGNITION	2nd EDITING	3rd PRODUCTION
EXAMPLE #1	Re: Discrimination "Do the symbols in the two problems below signify the same or different operations?" X - Y X + (-Y) ___same ___different	Re: Discrimination "The symbols used in the problem below incorrectly signify that (Y) should be subtracted from (X)." "Change the notation to make it correct." X - (-Y)	Re: Discrimination and Association "What numerical operation is required by the notation in the following problem?" X + (-Y) OR "What is the answer to the following problem?" 5 + (-3) = ?
EXAMPLE #2	Re: Associations "Which of the following is correct?" ___he is ___he are	Re: Associations "This sentence is incorrect. Fix it." she are	Re: Associations "What is the correct form of the verb 'to be,' present tense, for I ___"
EXAMPLE #3	Re: Chains "A binomial expansion [$(X + Y)^5$] is performed both correctly (A) and incorrectly (B)." (Both process and output are shown.) The student is asked: "Which is the correct way, A or B?"	Re: Chains "This binomial expansion is incorrectly performed." "Correct the error or the wrong step."	Re: Chains "Expand this binomial." $(X + Y)^6$

G.2.1
IDENTIFICATION MATRIX

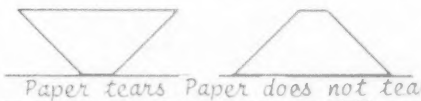
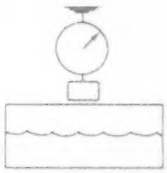
CRITERIA FOR IDENTIFYING THE CHARACTERISTICS OF PROGRESSION (c): (1) VISUAL EXAMPLES/(2) VERBAL EXAMPLES OR VERBAL PRINCIPLES OR PROGRESSION (d): (1) CONCRETE EXAMPLES/ (2) ABSTRACT EXAMPLES OR PRINCIPLES

PROGRESSION (c), (d) MODE	1st in sequence Practice with VISUAL EXAMPLES or CONCRETE EXAMPLES (verbal)	2nd in sequence (CRITERION BEHAVIOR) Practice with VERBAL EXAMPLES or VERBAL CONCEPTS or VERBAL PRINCIPLES
CRITERIA	-*A visual example or a concrete (verbal) example of:* ••*A concept, or* ••*A principle* *is presented as the GIVEN* -*The learner responds to the example verbally:* ••*Classifying the example* ••*Identifying properties of the example* ••*Stating the relationships between conceptual properties of the example* ••*Predicting events on the basis of relationships among conceptual properties* *OR* -*The learner responds to the example visually; i.e., in non-verbal terms accomplishing the same goals as above*	-*A verbal or abstract example of:* ••*The same concept, or* ••*The same principle* *is presented as the GIVEN* -*The learner responds to the example verbally:* ••*Classifying the example* ••*Identifying properties of the example* ••*Stating the relationships between conceptual properties of the example* ••*Predicting events on the basis of relationships among conceptual properties*
RATIONALE	Visual examples or concrete examples are INPUTS which are generally selected for the properties they possess which can elicit actions already associated with them	Actions just having been practiced in response to visual or concrete examples can now more readily be associated with verbal or abstract INPUTS

EXAMPLES	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING PROGRESSIONS:
(c) VISUAL/VERBAL AND (d) CONCRETE/ABSTRACT

	1st	2nd
(c)	VISUAL PRACTICE	Followed by: VERBAL PRACTICE (criterion behavior)
EXAMPLE #1	The physics student first practices predicting during visual demonstrations what will happen to paper on which the same object is placed but in different positions, i.e.,  Paper tears Paper does not tear	Subsequently, the student learns in verbal terms about the relationship between weight (i.e., force) and the distribution of the force over different areas; i.e., he learns about pressure--which he defines verbally or illustrates verbally
EXAMPLE #2 	The physics student observes the decrease in the reading (on a hanging scale) when an object is first weighed in air, then in water. He predicts the direction of change for other examples (i.e., clockwise or counter-clockwise)	During subsequent verbal practice involving verbally stated problems, the student learns to define "apparent loss of weight"; he will predict that the object will "weigh less" in water
(d)	CONCRETE PRACTICE	Followed by: ABSTRACT PRACTICE
EXAMPLE #1 "Walking to work was his answer to the exercise problem"	The English student first practices identifying ways of emphasizing key points in a sentence by dealing with actual sentences; i.e., identifying the placement of a key idea in a sentence as the technique used	The student then may be given practice in discussing more abstractly the relationship between emphasis and placement of key ideas in sentences
EXAMPLE #2	The physics student first is given practice with concrete examples--such as horses pulling wagons, boys lifting chairs, or men pushing a car	Subsequently, in a more abstract way, he learns to define a force as a push or pull

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSION: (e) PROCEDURES/VERBAL PRINCIPLES

PROGRESSION (e)	1st stage in sequence: PRACTICE OF PROCEDURES	Subsequent stage in sequence: PRACTICE OF PRINCIPLES ABOUT PROCEDURES
CRITERIA	*-The learner first learns how to do something:* *··A procedural chain*	*-The learner then learns to deal in verbal terms about the procedures; dealing with:* *··Problems* *··Issues* *··Concepts, principles* *··Rules* *··Rationales* *··Functions*
RATIONALE	The learner first gains concrete experience learning how to do something; subsequently, he is better able to deal with an abstract treatment of issues concerning the skill he has learned. The criterion behavior may consist of: (1) Being able to talk about the procedures (and the issues involving them) OR (2) Both being able to perform the procedures and being able to talk about issues concerning them	

EXAMPLES	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING PROGRESSION:
(e) PROCEDURES/VERBAL PRINCIPLES

EXAMPLES

PROGRESSION (e)	1st stage in sequence: Practice of PROCEDURES	2nd stage in sequence: Practice of VERBAL PRINCIPLES
EXAMPLE #1	A teacher first practices implementing reinforcement principles in managing behavior in the classroom e.g., with the help of procedural guidelines, she actually practices shaping gradually increasing durations of persistence at work	Following concrete experience in actually implementing shaping procedures, she is given verbal practice in dealing with rules, rationale, issues, problems, etc., involved in using the shaping process e.g., she may practice verbally identifying: ··When it is appropriate to use shaping techniques/ when it is not ··When to provide reinforcement in the shaping routine/when not to
EXAMPLE #2	The instructional materials developer first practices (and therefore learns how to) follow all procedures involved in the development process	Subsequently, he is exposed to verbal treatment of issues, concepts, problems, etc., dealing with the development process (and engages in verbal practice--talking about the development process)

DISCUSSION OF PROGRESSIONS INVOLVING:

3. CUES	page
What functions do cues serve?	90
What are "prompting" and "fading"?	92
f. Examples or demonstrations	94
g. Verbal cues	94
h. Visual cues	94
i. Diagrams or overviews	96

G.2.1

CRITERIA FOR IDENTIFYING FUNCTIONS SERVED BY USING CUES

IDENTIFICATION MATRIX

FUNCTIONS SERVED BY CUES	ELICIT responses	MAKE IDENTIFICATIONS
CRITERIA	-*Cues elicit responses already associated with them* -*The responses are CRITERION responses which have to be practiced but could not be unless cues were used to elicit them (i.e., the learner doesn't know how to)* -*Eventually, the responses elicited by cues get transferred to CRITERION INPUTS* -*Cues are used together with CRITERION INPUTS so that the learner can make correct responses to the CRITERION INPUTS* -*Cues make identifications which make possible: correct responses to CRITERION INPUTS; and/or taking of correct CRITERION ACTIONS* *(See next column)*	-*Cues identify* *··CRITERION INPUTS* *··And/or their properties* *which facilitate the practice of: discriminations and generalizations involving those INPUTS* -*Cues identify* *··CRITERION ACTIONS* *··And/or their properties* *which facilitate the practice of: ACTION generalizations, associations, and chains* -*Cues make identifications which aid in overcoming barriers to the learning of component skills (e.g., similarity/dissimilarity, number of properties, number of classes, etc.)*

EXAMPLES	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING HOW CUES MAKE IDENTIFICATIONS WHICH ASSIST THE LEARNING OF COMPONENT SKILLS

EXAMPLES

IDENTIFICATIONS	Re: CRITERION INPUTS -Discriminations -Generalizations	Re: CRITERION INPUTS and ACTIONS -Associations	Re: CRITERION INPUTS and ACTIONS -Chains
EXAMPLE	The learner has to discriminate between actual examples from three classes of levers and generalize across examples within each class	The learner has to associate ENGLISH language equivalents (ACTION) for foreign language words (INPUTS)	The learner has to learn the order of procedures (a chain) in assembling an electric motor
VERBAL CUES: ··Rules ··Principles ··Instructions ··Labels ··Examples ··Checklists ··Manuals	e.g., a verbal principle is stated identifying the locations of effort force, resistance force, and fulcrum relative to one another for each class of lever. The learner has this available as he classifies particular examples of each type of lever	e.g., a set of flash cards pair the foreign language and English language equivalents, cuing the practice of saying the English language equivalent for a foreign language word	e.g., a checklist of procedures listed in the correct order is provided as the student learns to assemble the motor
NON-VERBAL CUES: ··Pictures ··Diagrams ··Mock-ups ··Actual objects ··Demonstrations ··Examples ··Markers	e.g., an actual and familiar example of a third class lever is provided when the learner is required to classify a different example of a third class lever e.g., arrows (pointing up and down) are used in an illustration of a lever to identify the locations of the effort force and resistance force to assist the learner to classify an example of a lever	e.g., a set of pictures of objects is paired with foreign language words--eliciting the English language equivalent	e.g., a filmed demonstration is made available to the student as a model of how to assemble the motor parts in the correct sequence e.g., a diagram is provided showing the locations of parts and a numbering sequence identifying order of assembly

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSIONS INVOLVING PROMPTING (USE OF CUES) AND FADING (THE EVENTUAL ELIMINATION OF CUES)

PROGRESSION	1st stage in sequence: MAXIMAL PROMPTING	Intermediate stages in sequence: GRADUAL FADING OUT OF PROMPTS	Final stage in sequence: ABSENCE OF ALL PROMPTS (criterion behavior)
CRITERIA	*-Cues make an identification which is:* *··Exact* *··Complete* *··Direct*	*-Cues are gradually weakened, lessened, etc., resulting in identifications which are:* *··Inexact* *··Incomplete/partial* *··Indirect/oblique*	*-No cues are provided*
RATIONALE	-You start by providing assistance to the learner and gradually wean him of it, until he can perform unaided -It is desirable to start with the weakest degree of assistance you can provide that still allows the learner to perform without making errors -It is desirable to withdraw assistance as fast as you can (but gradually when you have to) and still allow the learner to perform without making errors -Summary: The learner should be brought to criterion performance as quickly as he can be but be prepared to do it gradually when he cannot		

EXAMPLES	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING PROGRESSIONS WHICH INVOLVE PROMPTING/FADING

EXAMPLES	1st	Intermediate	Final
PROGRESSION	CUES MAKE IDENTIFICATIONS WHICH ARE: ··Exact ··Complete ··Direct	GRADUAL LESSENING OF IDENTIFICATIONS: ··Inexact ··Partial ··Indirect	NO CUES
EXAMPLE #1	A drawing of a hydrogen atom is provided showing the number of electrons involved in it. The student is required to state how many electrons a hydrogen atom has.	The student is told where in the periodic table the element hydrogen is. He is asked to state how many electrons a hydrogen atom has.	The student is asked to state how many electrons there are in a hydrogen atom.
EXAMPLE #2	The student is shown an actual example of a hyacinth bulb. Given a variety of bulbs, he is required to pick out the hyacinth bulbs.	The student is given a verbal description of physical properties of hyacinth bulbs. Given a variety of bulbs, he is required to pick out the hyacinth bulbs.	Given a variety of bulbs, the student is required to pick out the hyacinth bulbs.
EXAMPLE #3	The student is shown in print the present tense of a verb for the third person, singular, "he walks." Then he is given as a subject "the man" and is required to write "walks."	The student is shown in print the present tense of a verb for the third person, singular, "he walks." He is then required to use another verb in the same tense, same person.	The student is required in writing a paragraph (in the present tense) to use the correct form of the verb.

G.2.1

CRITERIA IDENTIFYING PROGRESSIONS INVOLVING THREE DIFFERENT TYPES OF CUES: (f) EXAMPLES OR DEMONSTRATIONS; (g) VERBAL CUES; (h) VISUAL CUES

IDENTIFICATION MATRIX

TYPES OF CUES	(f) EXAMPLES or DEMONSTRATIONS	(g) VERBAL CUES	(h) VISUAL CUES
CRITERIA	*(1)* *-An example is provided which assists the learner to make discriminations, generalizations, or associations involving other examples* *-It can be an example of an INPUT, an ACTION, or an OUTPUT or a combination of them* *-The example assists by identifying the basis for the discriminations, generalizations, or associations by acting as a model* *-In the final stage of the progression, no examples are provided; the learner is required to exhibit the criterion behavior unassisted* *(2)* *-A demonstration is provided as a model to assist the learner in exhibiting a chain (assisting him with the discriminations, generalizations, or associations of a particular sub-step or assisting him with the sequencing of sub-steps)*	*••Rules* *••Principles* *••Instructions* *••Labels* *••Checklists* *••Manuals* *••Etc.* *-Are provided to assist the learner with discriminations, generalizations, associations, and chains* *-They assist in the following ways:* *••By calling attention to particular INPUTS* *••By calling attention to properties of INPUTS* *••By calling attention to ACTIONS or their properties* *••By identifying which INPUTS go with which ACTIONS* *••By identifying the sequence of a series of associations* *••By specifically calling attention to or identifying the barriers to or difficulties in what needs to be learned*	*••Pictures* *••Diagrams* *••Overlays* *••Objects* *••Physical attributes (color, size, shape, etc.)* *••Symbols* *••Etc.* *-Are provided to assist the learner with discriminations, generalizations, associations, and chains* *-They assist in the following ways:* *••By calling attention to particular INPUTS* *••By calling attention to properties of INPUTS* *••By calling attention to ACTIONS or their properties* *••By identifying which INPUTS go with which ACTIONS* *••By identifying the sequence of a series of associations*

EXAMPLES	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING PROGRESSIONS INVOLVING THREE DIFFERENT TYPES OF CUES: (f) EXAMPLES OR DEMONSTRATIONS; (g) VERBAL CUES; (h) VISUAL CUES

CUES	(f) EXAMPLES or DEMONSTRATIONS	(g) VERBAL CUES	(h) VISUAL CUES
—	EXAMPLES as cues e.g., "Here are some plural nouns: houses, trees, dogs, pencils Put a check alongside the plural nouns in the following list. ___bow ___tools ___cups ___farm ___dog ___cake ___desks ___papers Eventually, the learner will be expected to recognize or to produce plurals without examples in view. DEMONSTRATIONS as cues e.g., A lecturer demonstrates on the blackboard the sequence of sub-steps involved in the computation of an arithmetic mean for ungrouped test scores. Following this, the learner is required to compute the arithmetic mean for another set of scores given him. e.g., the tennis coach demonstrates the correct and incorrect amount of knee bending for balls coming at particular heights (assisting in making discriminations between ball heights and associating amount of knee bending with a given ball height). The student then practices bending his knees for balls hit to him. Eventually, students perform the criterion behavior without benefit of a just prior demonstration.	e.g., two contrasting paragraphs, illustrating poor and good development of ideas, are prefaced by instructions to the English student to pay attention to the specific ways in which the paragraphs are developed. The prior instructions call attention to specific properties of the paragraphs so that the learner can discriminate between them. e.g., a verbal rule is provided for thinning down of water-based and oil-based paints: "Use water for water-based paints; use turpentine for oil-based paints." The student is then asked to thin down cans of oil- and water-based paints. In all these examples the learner eventually progresses to the point where he practices without benefit of the verbal cues used to assist him (i.e., he practices the criterion behavior)	e.g., a series of overlays placed on top of one another one-by-one is used to identify (on an illustration) where parts of a motor go (aiding the learner to associate parts with locations) and the succession of placements of overlays identifies the sequence in which each part is assembled (assisting the learning process). The learner then practices assembling the motor. e.g., Keys of a typewriter are color-coded as are the fingernails of the learner. This assists the learner to associate the placement of fingers (ACTIONS) the the appropriate keys (INPUTS). Appropriate matches have the same color. In all these examples the learner eventually progresses to the point where he practices without benefit of the visual cues used to assist him (i.e., he practices the criterion behavior)

G.2.1

CRITERIA FOR IDENTIFYING PROGRESSIONS USING DIAGRAMS AS CUES (i)

IDENTIFICATION MATRIX

PROGRESSION (i)	Initial stage in sequence A DIAGRAM as cue	Final stage in sequence CRITERION BEHAVIOR (no cues)
CRITERIA	-*A diagram may be kept in view during practice* -*A diagram may be consulted just prior to practice* *USE OF PHYSICAL PROPERTIES OF DIAGRAMS TO FACILITATE: DISCRIMINATIONS, GENERALIZATIONS, ASSOCIATIONS, OR CHAINS* *(1) Spatial separation of "squares" identifies classes of INPUTS to be discriminated* *(2) Enclosure within a single "square" identifies variations in INPUTS which still allow them to be in the same class* *(3) Adjacency and/or sequential ordering of "squares" identifies: (a) INPUTS and ACTIONS which are to be associated; or (b) the series of associations in a chain* *(4) A whole constellation of "squares" may summarize or provide an overview of all the discriminations, generalizations, associations, or chains involved in a criterion behavior*	-*Criterion behavior or preparatory behaviors are practiced without the aid of diagrams*

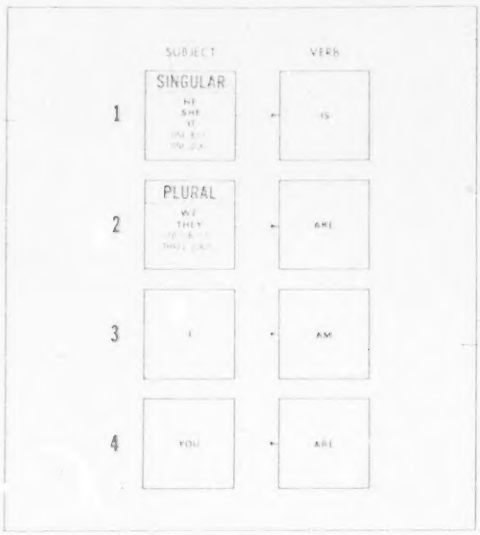
EXAMPLES	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING THE USE OF DIAGRAMS (i) AS PART OF A PROGRESSION

EXAMPLES

PROGRESSION (i)	Initial stage DIAGRAM available (i)	Final stage CRITERION BEHAVIOR (no diagram)



-*The student learning English grammar is given a diagram summarizing the rule for singular and plural nouns and personal pronouns and the present tense of the verb "to be"*

-*The diagram facilitates: discriminations among subject classes, generalizations within subject classes, and the proper association between subject and verb*

-*The student practices writing sentences using the verb "to be" in the present tense with the diagram in front of him*

-*Another subsequent stage of practice (preceding criterion practice) could consist of showing the diagram to the student just prior to practice but removing it during actual practice*

SEE EXAMPLES IN NEXT COLUMN

-*Eventually, the student practices writing sentences using the verb "to be" in the present tense without the aid of the diagram*

EXAMPLES OF PROBLEMS WHICH MIGHT BE ACCOMPANIED BY THE ABOVE DIAGRAM

(1) *Fill in the blanks using the right form of the verb "to be":*

--The girl _____ beautiful

--The dog _____ sick

--The leaves _____ green

--You two _____ correct

--He _____ my father

--I _____ ready to go .

TEACHING 'CONCEPTS' WITH THE USE OF A DIAGRAM*

	PERFECTLY ELASTIC OBJECTS	NOT PERFECTLY ELASTIC OBJECTS	DISCUSSION
CONCEPTS			-The concept 'labels' appear in the top row.
Examples	.. rubber ball .. coiled spring .. metal stay	.. paper .. cloth .. flower petal .. paper clip	-Every day familiar examples of the concept or class appear in this row. -Varied or divergent examples may be used.
Definition			
DEFINING PROPERTIES	RELEVANT properties: -An object whose shape will change when a stress is applied to it but will return to its original shape when the stress is removed e.g. the ball will compress when squeezed but return to its original shape when no longer squeezed	RELEVANT properties: -An object whose shape will change when a stress is applied to it but will not return to its original shape when the stress is removed e.g. a shirt will crumple when bunched up; will not smooth out perfectly when straightened.	-The relevant properties of the class or concept appear in this row. -This helps the discrimination between examples having and examples not having those properties.
POSSIBLE VARIATIONS	IRRELEVANT properties: .. shape .. type of material .. color .. size e.g. the rubber ball is spherical, the metal stay linear	IRRELEVANT properties: .. shape .. type of material .. color .. size e.g. a paper clip is linear (like the metal stay) but it is still not perfectly elastic	-Irrelevant properties which examples belonging to a class may have appear here. -This helps the generalization across varied examples which may appear to be different (but still belong to the class)

*The third column provides an explanation of the first two.

Items To Be Practised With The Aid of The Above Diagram

Along side each of the following items put a check mark indicating whether it's perfectly elastic (P.E.) or not (not P.E.)

	P.E.	Not P.E.
piece of aluminum foil		
tuning fork		
felt hat		
tennis ball		
cardboard box		

DISCUSSION:

-The learner acquires the concept 'perfectly elastic' by reading the diagram and in this exercise practises applying it to new examples not found in the diagram.

-TRANSFER to new examples is facilitated.

DISCUSSION OF PROGRESSIONS INVOLVING

4. CONTENT	page
What are "content" progressions?	101
j. Principles about procedures/ procedures	102
k. Altered criterion behavior/ criterion behavior	104
l. Practice of errors/ criterion behavior	104
m. Editing/criterion behavior	104
n. Backward chaining	106

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING THREE TYPES OF "CONTENT" PROGRESSIONS

TYPES OF CONTENT PROGRESSIONS	Before practice of criterion behavior: Practice of BEHAVIOR DIFFERENT FROM CRITERION BEHAVIOR	Before practice of criterion behavior: Practice of ALTERED VERSION OF CRITERION BEHAVIOR	Before practice of criterion behavior: Practice of COMPONENTS OF CRITERION BEHAVIOR IN A NON-CRITERION SEQUENCE
CRITERIA	-*Practice required to learn principles about procedures when the criterion behavior involves performing the procedures* ••*Progression (j)* -*Practice which involves critiquing a performance (e.g., recorded on tape) of the criterion behavior (whether one's own or someone else's)* ••*Progression (m)*	-*Practice involving a variation (e.g., exaggeration or distortion) in criterion INPUTS or ACTIONS* ••*Progression (k)* -*Practice of an incorrect version of criterion behavior (i.e., practice of errors)* ••*Progression (l)*	-*Practice of actual, non-varied components of criterion behavior but in a sequence different from the sequence found in the criterion situation* ••*Progression (n)*
	-For discussion of (j), see page 102 -For discussion of (m), see page 104	-For discussion of (k), see page 104 -For discussion of (l), see page 104	-For discussion of (n), see page 106

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSION: (j) PRACTICE OF PRINCIPLES ABOUT PROCEDURES/PRACTICE OF THE PROCEDURES THEMSELVES

PROGRESSION (j)	1st stage in sequence PRACTICE OF: PRINCIPLES ABOUT PROCEDURES (j)	2nd stage in sequence PRACTICE OF: PROCEDURES (criterion behavior)
CRITERIA	*-The learner practices stating verbal rules or principles about how to do something* *-He thereby learns and retains the verbal rules about procedures to follow in performing a task*	*-The learner then practices performing the procedures involved in the task* *-The criterion behavior consists of performance of the procedures*
RATIONALE	1. Retention of verbal rules or principles keeps them available to the performer after he has completed instruction or training. They assist performance of procedures even in the criterion situation. 2. Contrast of progression (j) with progression (g): verbal cues (g) Verbal cues (rules or principles) are used only during practice to make possible the correct practice of criterion behavior. They are not available during post-instructional performance of the criterion behavior. (j) Practice stating rules and their confinement to memory makes them available during performance of criterion behavior. 3. Contrast of progression (j) with progression (e): procedures/principles (e) Progression (e) involves two types of criterion behavior: i.e., the performance of procedures and verbally dealing with issues about those procedures. Procedures are practiced first to provide a concrete experience to make it easier to learn the principles. (j) Progression (j), in effect, has two criterion behaviors. The original and primary criterion behavior is the performance of procedures. Because it is judged that performance of procedures cannot occur without assistance, verbal principles are learned (become a criterion behavior) not for themselves but as a means of providing post-training assistance for performance of procedures.	

EXAMPLE	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING PROGRESSION: (j) PRACTICE OF PRINCIPLES ABOUT PROCEDURES/PRACTICE OF THE PROCEDURES THEMSELVES

EXAMPLES

PROGRESSION (j)	1st stage in sequence PRACTICE OF: PRINCIPLES ABOUT PROCEDURES (j)	2nd stage in sequence PRACTICE OF: PROCEDURES (criterion behavior)
EXAMPLE #1	-*The teacher trainee in pre-service training or the teacher receiving in-service training,* *first engages in practice to learn rules about the use of reinforcement principles in managing problem behavior in the classroom* -*Rules concern:* ••*Identifying situations calling for differential treatment* ••*Procedures to follow in implementing the differential treatment*	-*Subsequent practice involves actually managing problem behavior in a classroom* -*Practice involves:* ••*Identifying types of problems; AND* ••*Selecting and implementing the proper technique for dealing with it (e.g., reinforcement, shaping, extinction, etc.)*

G.2.1

CRITERIA FOR IDENTIFYING THREE TYPES OF CONTENT PROGRESSIONS; I.E., PRACTICE OF CRITERION BEHAVIOR IS PRECEDED BY OTHER TYPES OF BEHAVIOR: (k) ALTERED CRITERION BEHAVIOR; (l) INCORRECT CRITERION BEHAVIOR; and (m) EDITING BEHAVIOR

IDENTIFICATION MATRIX

THREE TYPES OF CONTENT PROGRESSIONS	(k) Practice of ALTERED CRITERION BEHAVIOR followed by practice of criterion behavior	(l) Practice of INCORRECT CRITERION BEHAVIOR followed by practice of criterion behavior	(m) Practice of EDITING BEHAVIOR followed by practice of criterion behavior
CRITERIA	-*Criterion INPUTS may be exaggerated or distorted to make discriminations among them easier* ••*Using pairs of INPUTS which are grossly different and gradually narrowing the differences until the learner can make fine discriminations between highly similar examples*	-*The learner practices the wrong way and the right way to do something* ••*He may be required to practice wrong things he is now doing which may interfere with learning of the correct way* *OR* ••*He may be required to practice behavior which tends for most people to be error-prone*	-*The learner engages in critiquing behavior: he critiques his own (or someone else's) initial performance of criterion behavior* -*Subsequently, he engages in practice of the criterion behavior itself*
RATIONALE	-This kind of practice creates a relatively easy discrimination and builds up learner capacity to deal with difficult discriminations	-Practice of errors facilitates discriminating between the right and wrong way to do something	-Critiquing a performance aids in acquiring discriminations between the right and wrong way to do things which facilitates the subsequent correct practice of the criterion behavior
EXAMPLE	SEE OPPOSITE PAGE		

G.2.1

EXAMPLES ILLUSTRATING THREE TYPES OF CONTENT PROGRESSIONS: (k), (l), and (m)

EXAMPLES

THREE TYPES OF CONTENT PROGRESSIONS	(k) Practice of ALTERED CRITERION BEHAVIOR followed by practice of criterion behavior	(l) Practice of INCORRECT CRITERION BEHAVIOR followed by practice of criterion behavior	(m) Practice of EDITING BEHAVIOR followed by practice of criterion behavior
EXAMPLES	*e.g., the music student may have difficulty hearing quarter-tone differences; the student may be started distinguishing between whole note differences, gradually working down to quarter-tone differences* *e.g., an English-speaking student studying Chinese, a language with varied tones, may have difficulty hearing variations in tones. A falling tone may be demonstrated in a grossly exaggerated way. Subsequently, it is presented in the normal (criterion) way.* The prior exaggeration makes the subsequent criterion discrimination possible.	*e.g., some speakers of non-standard English omit the "s" sound from: (1) plural nouns ("two bou"), (2) verbs ("the man walk"), and (3) possessives ("the man house").* *Practice saying: "bou - bous" or "walk - walks" or "the man house - the man's house" enables the student to acquire a discrimination between the use (correct) and non-use (incorrect) of the "s" marker.* Subsequently, the student is required to practice only the correct or criterion version. *e.g., the tennis student or golf student may be asked to practice swinging the wrong way and the right way so that he can feel the difference. Being able to feel the difference, subsequently provides him feedback (during criterion practice), telling him when he has swung incorrectly.*	*e.g., the student teacher's classroom performance is taped, and the student teacher critiques her own performance.* *She learns to distinguish between correct and incorrect elements in her performance.* (If critiquing practice is guided, it may be possible for the student to focus on "discriminations," "generalizations," "associations," or "chains" not yet learned or incorrectly learned) Following critiquing practice, the student engages in classroom teaching practice, the criterion performance.

G.2.1

CRITERIA FOR IDENTIFYING PROGRESSION: (n) BACKWARD CHAINING

IDENTIFICATION MATRIX

PROGRESSION (n)	1st stage in sequence	2nd stage in sequence	3rd and subsequent stages in sequence
CRITERIA	-*Practice of last sub-step in a chain*	-*Practice of the next to last sub-step and the last step in a chain*	-*Practice of the next to the next to the last sub-step and the next to the last and the last sub-step in the chain* -*Each increment goes one sub-step back in the chain* -*Finally, the whole chain is practiced (criterion behavior)*
TWOFOLD RATIONALE	Rationale 1: Mastery of a sub-step allows the learner to determine whether he has correctly performed the just prior step. This is accomplished by the already mastered sub-step providing feedback after the learner practices the prior sub-step and the mastered sub-step Sub-STEP A → Sub-STEP B → Sub-STEP C When the learner practices B, and then C is correctly performed right after it, the correctness of C, in turn, confirms that B was correctly performed. Rationale 2: If A and B are demonstrated to the learner and he then practices C, the demonstration of A and B serves as a model of how to perform A and B. If A is demonstrated and then B and C are practiced, the additional demonstration of A serves as a model of how to do A. The learner can model his own performance on what he has seen demonstrated by an expert.		

EXAMPLE	SEE OPPOSITE PAGE

G.2.1

EXAMPLES ILLUSTRATING PROGRESSION:
(n) BACKWARD CHAINING

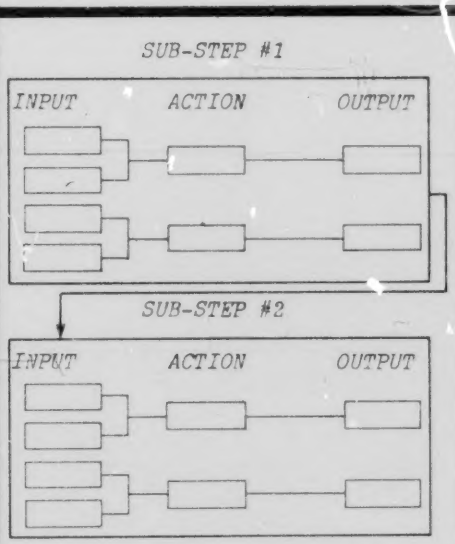
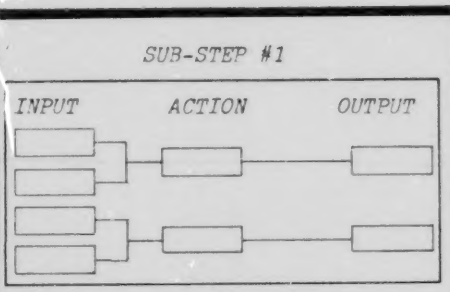
EXAMPLES

PROGRESSION (n)	1st stage in sequence	2nd stage in sequence	3rd stage in sequence (and so on)
EXAMPLE #1 Re: FEEDBACK	$9\overline{)495}$ 45 / 45 / 45 — *The student first practices the last step--subtracting 45 from 45.*	$9\overline{)495}$ 45 / 45 — *The student practices multiplying 9 x 5; then, subtracting 45 from 45. The correct remainder provides feedback as to the correctness of the prior step.*	$9\overline{)495}$ 45 / 45 — *The student practices dividing 9 into 45; then, multiplying 5 x 9; then, subtracting 45 from 45. Practice continues in this way all the way back to 9 |495*
EXAMPLE #2 Re: MODELING	*The person learning how to play bridge first learns to "play" (only then how to bid). Bidding is demonstrated to him; he then practices playing.*		*Having had "bidding" demonstrated to him (while learning to "play"), he has a model on which to base his practice of "bidding."*

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING TWO TYPES OF BACKWARD CHAINING: INTER-SUB-STEP AND INTRA-SUB-STEP

TYPES OF BACKWARD CHAINING	INTER-SUB-STEP	INTRA-SUB-STEP
CRITERIA	 -*In inter-sub-step backward chaining, Sub-step #2 is practiced (and learned) before Sub-Step #1*	 -*Intra-sub-step backward chaining is concerned with only one sub-step* -*Sequence of practice involves:* ••*Practice of discriminations and generalizations re: OUTPUTS* *••*Practice of discriminations and generalizations re: INPUTS* *••*Practice of associations between INPUTS and ACTIONS* *May sometimes be done simultaneously; if discriminations are particularly difficult, they are likely to be practiced separately
RATIONALE	-Feedback -Modeling (See previous discussion)	(1) Ability to discriminate between correct and incorrect OUTPUTS permits a useful feedback function (2) There is no point in attempting to have the learner practice associations of INPUTS and ACTIONS if he cannot discriminate between INPUTS; therefore, he first learns the discriminations, and then the associations

DISCUSSION OF PROGRESSIONS INVOLVING:

5. FREQUENCY OR VARIATION	page
o. Repetition	110
p. Review	110
q. Variations in examples	112

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSIONS: (o) REPETITION AND (p) REVIEW

TYPES OF PROGRESSIONS	(o) REPETITION	(p) REVIEW
CRITERIA	-*The same examples are repeated during an instructional sequence --prior to practice of criterion behavior* ••*INPUT examples* ••*ACTION examples* ••*Example of pairinge of INPUT and ACTION* ••*Chain examples* -*Criterion behavior is practiced after repeated practice with examples*	-*The same examples or different examples are used in practice of criterion behavior one or more times following the initial practice of the criterion behavior*
RATIONALE	To facilitate the acquisition and retention of: discriminations, generalizations, associations, or chains	To facilitate the retention of discriminations, generalizations, associations, or chains

G.2.1

EXAMPLES ILLUSTRATING PROGRESSIONS:
(o) REPETITION AND (p) REVIEW

EXAMPLES

TYPES OF PROGRESSIONS	(o) REPETITION	(p) REVIEW
	e.g., the foreign language student repeats pairing (associating) English and foreign language equivalents. Using a set of flash cards, he sees the English word, produces the foreign word (and gets feedback). He goes through the same deck repeatedly. Repetition assures the acquisition of the associations. Subsequently, in criterion practice, the student may be required to translate the same words in a paragraph; or he may be given a scrambled list of English words and be required to produce the foreign language equivalent. e.g., a medical technician performing blood tests is required to discriminate between shades of red in order to determine a numerical value associated with it. The student technician is given repeated practice matching the color of test samples with standard colors (each of which represents a different numerical value on the test--say 6.0 on a uric acid test). Repeated practice assures a correct discrimination and pairing of the sample with the standard. Subsequently, the student performs in criterion fashion--coming up with a numerical value (based on a match between sample and standard)	e.g., the media specialist practices the complete threading of a film projector (criterion behavior). Subsequently, post-training he engages in identical practice to insure retention of the skill (a chain). e.g., the electronic trouble-shooter reviews the procedures involved in his job (using old and/or new conditions)--insuring the retention of the discriminations, generalizations, and associations (involved in identifying symptoms and interpreting conditions) and the chains (involved in the sequential procedures involved in trouble-shooting)

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSION:
(4) VARIATIONS IN EXAMPLES

PROGRESSION (q)	Early stages in sequence: A SERIES OF VARIED EXAMPLES	Final stage in sequence: PRACTICE OF CRITERION BEHAVIOR
CRITERIA	-*The learner engages in practice involving a succession of varying examples:* ••*Of INPUTS from each of several classes of INPUTS which must be discriminated* ••*Of INPUTS from a single class of INPUTS (which requires generalization)* ••*Of ACTIONS from a single class (if it requires generalization)*	-*The practice of criterion behavior follows practice with the succession of varying examples*
RATIONALE	Practice with varied examples facil'tates subsequent criterion performance in which the learner can be exposed to new examples (not encountered in prior practice) and make appropriate discriminations and generalizations	

G.2.1

EXAMPLES ILLUSTRATING PROGRESSION:
(q) VARIATIONS IN EXAMPLES

EXAMPLES

PROGRESSION (q)	Early stages in sequence: A SERIES OF VARIED EXAMPLES	Final stage in sequence: PRACTICE OF CRITERION BEHAVIOR
EXAMPLE #1	READ (1) FIRST →	(1) *The music student has to be able to identify 4/4 time or 3/4 time when he hears it, no matter what the piece of music is. (This is criterion behavior.)*
	(2) *Prior to practice of criterion behavior (1), the student is exposed to a variety of pieces of music at 4/4 time and a variety of 3/4 time. (Practice may involve pairs of pieces of music, and the learner may be merely required to select which is 4/4 or which is 3/4.)*	(3) *Following the sequence of varied examples, the student is put into the criterion situation and is expected to identify the "time" of any new piece of music played for him.* The prior practice with varied examples facilitated the learning of the necessary discriminations between different "times" and generalizations across the same "times."
EXAMPLE #2	READ (1) FIRST →	(1) *The English student has to be able to use the proper form of the verb "to be" (in the present tense)--for singular and plural nouns and personal pronouns.*
	(2) *Prior to the practice of the criterion behavior (1), he is given practice with a variety of singular and plural examples (perhaps at the recognition level or at the production level--with cues available).*	(3) *Following the sequence of varied examples, the student is put into the criterion situation--with new "noun" examples--and is expected to use the right form of the verb.* The prior varied practice enables him, in dealing with the new examples, (a) to discriminate between singulars and plurals, and (b) to generalize across multiple examples of singulars and to generalize across multiple examples of plurals. He is, therefore, able to produce the correct form of the verb for each new example.

JOB PROCEDURES

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Information available in Section II.A of FORM G.1(2)	116
How to enter and use matrix in Section II.A	117
Example illustrating use of matrix in Section II.A	119
SUMMARY OF JOB PROCEDURES	120
Adequacy of selection of progressions	121

G.2.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING TWO TYPES OF INFORMATION AVAILABLE IN SECTION II.A OF FORM G.1(2): "SELECT PREPARATORY PRACTICE PROGRESSIONS"

TYPES OF INFORMATION	GENERAL PROGRESSION STRATEGIES	SPECIFIC PROGRESSION STRATEGIES
CRITERIA	*Types of progressions useful in meeting learning and performance problems:* *— Re: PERFORMANCE PROBLEMS* *(1) Transfer (2) Delayed basis* *— — Re: LEARNING PROBLEMS* *(3) Discriminations* *(4) Generalizations* *(5) Associations (6) Chains* *(7) Action generalizations* *These progressions appear in the first unlabelled column of Section II.A--alongside the problem for which they are recommended*	*Types of progressions useful in meeting cross-classified problems:* *-Learning/performance problems (1-7) X Source of problems (A-F)* *-Learning/performance problems (1-7) X Mode (i, vi, vii)* *-Performance (2) X Learning/performance problems*

IIA Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a shaping gradual increases in quantity quality	b R/E/P c visual/verbal d concrete/abstract e procedures/principles	f examples or demonstrations g verbal cues h visual cues i diagramming overviews	j principles/procedures k altered criterion/ criterion l errors/criterion m editing/criterion n backward chaining	o repetition p review q varied examples

		2	A	B	C	D	E	F	i	vi	vii
1	q	o p	g	g				g i	e	h	i
3	b q	i o p	g h k	i g	i					h	
4	b q	i o p	g h	i g	i g				g	h	i
3+4	b i q	i o p	g h	i g	i g				c d e i		
5	b o	i o p			i g o p	b g i					
6	a f m n	o p					a n				a m n
7	i	o p						g h i			i

G.2.1

DECISION MATRIX

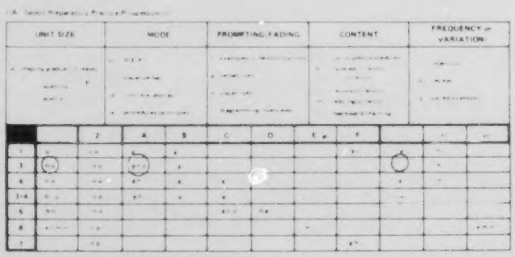
DETERMINING HOW TO ENTER MATRIX IN SECTION IIA IN ORDER TO SELECT PROGRESSION(S) SUITABLE TO PROBLEM AT HAND

INFORMATION TO REVIEW	-LEARNING and PERFORMANCE problems ••Numbers: 1-7 in Section IA of FORM G.1(2) are identified	-PROBLEM SOURCE ••Letters: A-F in Section IA of FORM G.1(2) are identified	-MODE ••Roman numbers: i, vi, vii in Section IA of FORM G.1(2) are identified
ACTION TO TAKE	*-Identify the endorsed (or predominant) performance and learning problem(s)* *-Note the corresponding number(s): (1-7)* *-Enter the ordinate of Section IIA for the endorsed number(s)* *-Circle the general progressions in the first column recommended for the problem(s)*	*-Identify the endorsed (or predominant) source(s) of the learning/performance problems* *-Note the corresponding letters: (A-F)* *-Enter the abscissa of Section IIA for the endorsed letter(s)* *••In the row corresponding to the learning problem(s)* *-Circle the additional progressions for this cross-classification of:* *••Problem and problem source*	*-Identify the endorsed (or predominant) mode* *-Note the corresponding Roman numbers: (i, ii, vii)* *-Enter the abscissa of Section IIA for the endorsed number(s)* *••In the row corresponding to the learning problem(s)* *-Circle the additional progressions for this cross-classification of:* *••Problem and mode*

EXAMPLE

SECTION IA OF FORM G.1(2)

SECTION IIA OF FORM G.1(2)



NOTE: (a) In Section IIA, a circle is drawn in row "3," 1st column--indicating that progressions for (3), discriminations, are being considered

(b) A circle is also drawn around "3 X A"--similarity being the source of the discrimination problem

(c) A circle is also drawn around "3 X i"--i.e., a "verbal" discrimination is involved

EXAMPLES ILLUSTRATING THE SELECTION FROM SECTION IIA OF PROGRESSIONS APPROPRIATE TO ENDORSEMENTS IN SECTION IA OF FORM G.1(2)

Form G.1(2)

LESSON [ ] *CRITERION BEHAVIOR* [ ]

IA Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ simulation ☐ aids available ☐ two directions (1) transfer [2] delayed basis ☐ recognition mode	INPUTS (3) discriminations (4) generalizations INPUTS & ACTIONS [5] associations [6] chains ACTIONS [7] generalizations ☐ partial proficiency	INPUTS (A) similarity (dis-) [B] No. of properties [C] No. of classes (for No. members/class) INPUTS & ACTIONS [D] existing associations [E] length of chain ACTIONS [F] integrative strength	INPUTS / OUTPUTS (i) verbal/symbolic [i] [ii] environmental [ii] [iii] audio [iii] [iv] non-realistic [iv] [v] transient [v] ACTIONS [vi] perceptual [viii] vocal [vii] motor [ix] sub-vocal

IIA Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a. shaping gradual increases in: quantity quality	b. R/E/P c. visual/verbal d. concrete/abstract e. procedures/principles	f. examples or demonstrations g. verbal cues h. visual cues i. diagramming, overviews	j. principles/procedures k. altered criterion/criterion l. errors/criterion m. editing/criterion n. backward chaining	o. repetition p. review q. varied examples

		2	A	B	C	D	E	F	i	vi	vii
1	(q)	o·p	(g)	g				g·j	(e)	h	j
3	b·q	i·o·p	g·h·k	i·g	i					h	
4	b·q	i·o·p	g·h	i·g	i·g				g	h	j
3+4	(b·i·q)	i·o·p	(g·h)	i·g	i·g				(c·d·e·i)		
5	b·o	i·o·p			i·g·o·p	b·g·l					
6	a·f·m·n	o·p					a·n				a·m·n
7	j	o·p						g·h·j			f

NOTE: All the circled letters in the matrix represent the range of available progressions suitable to the learning problems at hand. While it is likely that a combination of two or more progressions will be used, NOT all will be necessarily used.

G.2.1

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN SELECTING PROGRESSIONS SUITABLE FOR CROSS-CLASSIFIED CRITERION PRACTICE REQUIREMENTS

#1 PROBLEMS

From: Section IA - FORM G.1(2)

a. Identify the number(s) (1-7) endorsed (indicating the predominant learning/performance problem(s)

In: Section IIA - FORM G.1(2)

b. Enter the row corresponding to the number(s) endorsed

c. Circle the general progressions recommended in the first, unlabelled column

#2 PROBLEMS X PROBLEM SOURCE

From: Section IA - FORM G.1(2)

a. Identify the letter(s) (A-F) endorsed indicating the predominant source(s) of learning problem(s)

In: Section IIA - FORM G.1(2)

b. Enter the row corresponding to the number(s) endorsed AND the column(s) corresponding to the letter(s) endorsed

c. Circle the specific progressions in the cell (number X letter)

#3 PROBLEM X MODE

From: Section IA - FORM G.1(2)

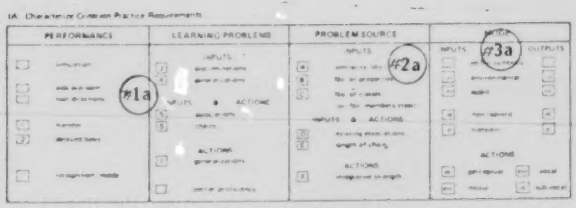
a. Identify the Roman numbers (i, vi, vii) endorsed indicating the predominant mode(s)

In: Section IIA - FORM G.1(2)

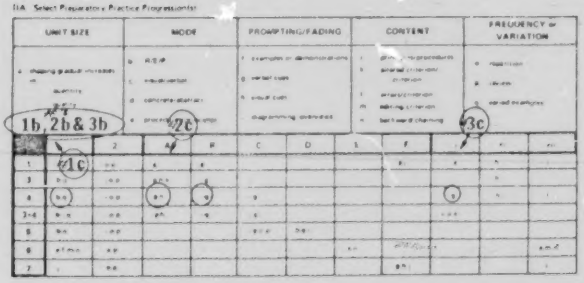
b. Enter the row corresponding to the Roman number(s) endorsed

c. Circle the specific progressions in the cell (number X Roman number)

SECTION I OF FORM G.1(2)



SECTION IIA OF FORM G.1(2)



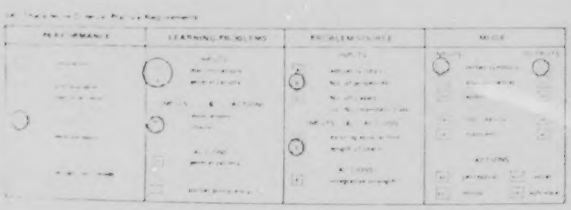
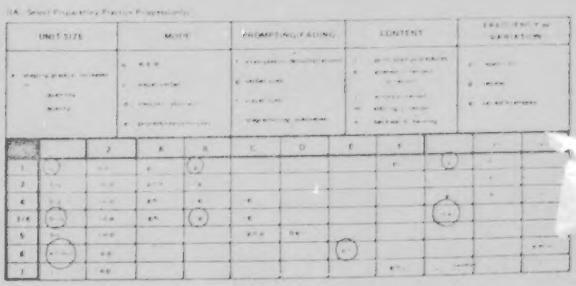
G.2.1

STANDARDS MATRIX

CRITERIA FOR ASSESSING THE ADEQUACY OF THE SELECTION OF PROGRESSIONS TO CONSIDER

PROPERTIES	RELEVANCE	COMPLETENESS
CRITERIA	-*Selection based on endorsements in Section IA of type(s) of:* ••*Performance requirements* ••*Learning problems* *AND on:* ••*Problem source* ••*Mode*	-*A progression selected for <u>each</u> and <u>every</u>* ••*Endorsed, numbered condition (1-7)* ••*Endorsed, numbered condition, <u>cross-classified</u> by <u>problem source</u>: (1-7) X (A-F)* ••*Endorsed, numbered condition, <u>cross-classified</u> by <u>mode</u>: (1-7) X (i, vi, or vii)* SEE NOTE AT BOTTOM OF PAGE 119.

EXAMPLE

SECTION IA OF FORM G.1(2)	SECTION IIA OF FORM G.1(2)
	

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Sample preparatory practice progressions to serve as a model when a complete instructional program is developed.*
WHAT YOU WILL WORK FROM	(1) All completed FORMS which define the criterion behavior. (2) The preparatory practice progressions selected and recorded in section IIA of FORM G.1(2).
WHAT YOU WILL DO	(1) Develop sample instructional materials which implement the selected preparatory progression.
FORMS YOU WILL USE	FORM G.1(2) -- section IIB for recording a description of the preparatory practice progressions.

DESCRIPTION OF Sub-STEP	G.2.2

INPUT	ACTION	OUTPUT
Descriptions of INPUTS, ACTIONS, and OUTPUTS in criterion behavior + selection of progressions on FORM G.1(2) iv	Prepare sample progressions to be used v	SECTION IIB of FORM G.1(2) containing, ~~actual~~ (or description of) progression vi

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Combinations of progressions . . 124-126 -MATRIX: Progressions for dealing with selected problems 127-149	-MATRIX: How to fill in SECTION IIB . . 152 -MATRIX: Where to get information for SECTION IIB . . 153	-MATRIX: Adequacy of design of progressions . . 155	SECTION IIB of FORM G.1(2) SUMMARY OF PROCEDURES 154

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		Collection of forms carried forward from	G.2.1	SECTION IIB of FORM G.1(2)
		SECTION IIA of FORM G.1(2)	G.2.1	

Sub-STEP G.2.2

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Descriptions of INPUTS, ACTIONS, and OUTPUTS in criterion behavior + selection of progressions on FORM G.1(2) iv	Prepare sample progressions to be used v	SECTION IIB of FORM G.1(2) containing actual (or description of) progression vi

SECTION IIB

1st row i.a	Prepare initial practice problem ii.a	Actual inputs, actions, and outputs (or description of them) of initial part of the learning progressions iii.a
2nd row i.b	Prepare intermediate practice problem ii.b	Actual inputs, actions, and outputs (or description of them) of intermediate part of the learning progressions iii.b
3rd row i.c	Prepare practice problem just prior to criterion practice ii.c	Actual inputs, actions, and outputs (or description of them) of final part of the learning progressions iii.c

BACKGROUND INFORMATION

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Combinations of "progressions" are generally used	125
Three types of progressions usually combined with other types	126
Discussion of progressions to deal with selected problems	127

G.2.2
IDENTIFICATION
MATRIX

CRITERIA FOR IDENTIFYING THE USE OF ONLY ONE TYPE OF PROGRESSION VS. THE MORE COMMON USE OF TWO OR MORE TYPES OF PROGRESSIONS IN COMBINATION

NUMBER OF PROGRESSIONS USED	ONLY ONE TYPE OF PROGRESSION	COMBINATIONS OF TWO OR MORE TYPES OF PROGRESSIONS
CRITERIA	*-Only one type of preparatory progression (from among all those recommended for a particular problem) is used* *-It alone is relied on to take the learner from entering behavior to criterion behavior* *-Use of single types is the less common practice*	*-Two or more types of preparatory progressions (from among all those recommended for a particular problem) are combined* *-The combination is used to take the learner from entering behavior to criterion behavior* *-Use of combinations is the more common practice*
EXAMPLE	*e.g., the use of diagrams, as in progression (i), may be used to guide the practice of using the present tense of the verb "to be":* 	*e.g., in addition to using the diagram (in the left-hand column), the learner may also be channeled through a recognition-editing-production sequence [as in progression in (b)].* *The learner, with the diagram available to him, would first practice selecting from options which of two or more verbs is appropriate for the sentence subject provided him. Then with the diagram still available, he would be expected to produce the correct verb.* *The ultimate, criterion practice would involve no diagram at all.*

G.2.2

CRITERIA FOR IDENTIFYING HOW THREE TYPES OF PROGRESSIONS ARE COMMONLY COMBINED WITH OTHER TYPES (OR WITH EACH OTHER)

IDENTIFICATION MATRIX

TYPES OF PROGRESSIONS COMBINED WITH OTHERS	1 PROMPTING/FADING progressions	2 MODE progressions	3 FREQUENCY/VARIATION progressions
CRITERIA	-*Cues selected to elicit responding by the learner can be used to accompany most other types of progressions* -*The cues used in combination can vary from: high strength to intermediate strength to low strength, and finally, to no cues at all (i.e., prompting/fading)* -*Progression involving cues which can be used in combinations with other types of progressions include:* *f. examples or demonstrations* *g. verbal cues* *h. visual cues* *i. Diagramming or overviews*	-*Other progressions can be employed within a basic progression: (b) recognize-edit-produce* -*Variations in cues can accompany the R-E-P progression which is, in turn, accompanying another progression*	-*The frequency/variation progressions which can be used along with other progressions include:* *o. Repetition* *p. Review* *q. Varied examples* -*Thus, features of other progressions would be repeated, reviewed, or varied*
EXAMPLES	e.g., *mathematics* -*The expansion of the binomial theorem is the criterion behavior* -*The basic progression selected might be (n): backward chaining* -*During practice of each part of the chain, the learner might be given verbal cues (g), providing assistance in how to perform that part of the chain--with the cues eventually being withdrawn*	e.g., *physics* -*The criterion behavior involves explaining Bernoulli's principles in one's own words* -*The basic progression selected is (c), the use of visual examples illustrating the principle; subsequently, verbal examples and verbal treatment of the principle which is involved follow* -*In each "half" of the progression, i.e., the visual portion and the verbal portion, the (b) progression might also be used. The learner, for example, might be given two options showing alternative outcomes and be asked to predict which of the two (or more) will occur under given conditions*	e.g., *teaching* -*The criterion behavior is discussing and interrelating principles underlying contingency management techniques* -*The basic progression selected is (e), procedures/principles, in which the teacher practices implementing the procedures before she practices discussing them* -*Added to this progression might be repetition in practicing the procedures for the same type of problem behavior or for a variant of it: progressions (p) and (q)*

DISCUSSION OF SELECTED LEARNING PROBLEMS
AND PROGRESSIONS FOR DEALING WITH THEM

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PROBLEM: (3) X (A): "Discriminating between similar INPUTS"	128
PROBLEM: (3 + 4): "Discriminations + generalizations" (i.e., concepts)	130
PROBLEM: (3 + 4) X (i): "Verbal concepts"	132
PROBLEM: (5) X (C): "Multiple associations"	134
PROBLEM: (6) X (E): "A long chain"	136
PROBLEM: (3 + 4) X (i) + (6): "Verbal chain involving verbal concepts"	138
PROBLEM: (3 + 4) + (6) + (7): "Problem-solving chain"	140

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSIONS RECOMMENDED FOR PROBLEM:
(3) X (A) -- "DISCRIMINATIONS AMONG SIMILAR INPUTS"

PROBLEM and RECOMMENDED SOLUTIONS	Problem: (3) X (A)	General solutions: b - q Specific solutions: g - h - k
CRITERIA	*-Discriminating between specific INPUTS which are highly similar*	*General Solutions for DISCRIMINATIONS* *b. R-E-P* *q. Varied examples* *Specific Solutions for SIMILARITY Problems* *g. Verbal cues* *h. Visual cues* *k. Altered criterion/criterion*

EXAMPLES	CRITERION BEHAVIOR	Recommended Solution
	e.g., being able to identify a singly presented 1/4 tone note; requires being able to discriminate between notes that are just a 1/4 tone apart and therefore are highly similar	(b) + (k) *e.g., presenting pairs of notes and requiring the learner to indicate whether they are the "same" or "different" (b);* PLUS *starting with pairs of notes which are different by a full tone (altered criterion INPUTS), and gradually narrowing the differences until the learner can hear 1/4 tone differences as being different* *Subsequently, the learner will listen to single notes and be able to identify them*

G.2.2

EXAMPLES ILLUSTRATING PROGRESSIONS RECOMMENDED FOR "DISCRIMINATIONS AMONG SIMILAR INPUTS": (3) X (A)

EXAMPLES

	CRITERION BEHAVIOR	RECOMMENDED PROGRESSIONS
#1	The medical student has to interpret electrocardiogram printouts. LEARNING PROBLEM Patterns on the printouts are highly similar. To be able to interpret a given pattern correctly, the student has to be able to discriminate between it and highly similar patterns which signify a different condition.	(b) + (c) *Pairs of patterns which are discernibly different are first presented to the student who is required to indicate whether they are the same or different. Gradually, in a succession of paired examples, differences are narrowed until the student can discriminate between patterns which are highly similar and are therefore difficult to discriminate* (g) or (h) + (b) *The primary progression first involves practice at the recognition level (pairs of similar patterns to be discriminated); eventually, practice at the production level involves identification of a single pattern.* *Verbal cues or visual cues are combined with recognition, editing, and production practice problems to make the discrimination easier. For example, a verbal statement or an arrow can call attention to a distinctive feature of a particular pattern. Gradually, in each type of practice (i.e., R-E-P), these prompts are faded out.*

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING LEARNING PROBLEM: (3 + 4): "DISCRIMINATIONS + GENERALIZATIONS" --I.E., CONCEPTS

LEARNING PROBLEM and RECOMMENDED SOLUTIONS	PROBLEM: (3 + 4) DISCRIMINATIONS + GENERALIZATIONS	RECOMMENDED SOLUTIONS: GENERAL SOLUTIONS: b. R-E-P i. Diagrams q. Varied examples
CRITERIA	-*The learner has to discriminate between INPUTS* *PLUS* -*The learner also has to generalize across INPUTS* -*The learner must, therefore, learn "concepts"* ··*What belongs to the same CLASS of INPUTS (generalization)* ··*What belongs to other CLASSES of INPUTS (discrimination)*	*q. VARIED EXAMPLES* -*The learner is presented with varied examples of INPUTS belonging to the:* ··*Same class* ··*Different classes* -*He is given practice classifying them (i.e., practice making discriminations among and generalizations across them)* *b. R-E-P* -*Examples from the same and different classes are presented as options in recognition practice (before subsequent production practice--in which the learner classifies a single example at a time)* *i. DIAGRAMS* -*Examples of the same class can be grouped within one bounded area (e.g., a square) and contrasted with examples from another class grouped in a separate, adjacent square*
EXAMPLES	e.g., concepts: "red," "blue," and "green" -*As the criterion behavior the learner has to classify objects of varying colors as being red, blue, or green (Action can consist of grouping the objects, labeling them by color, etc.)* -*The learner has to learn to discriminate between red, blue, and green colored objects* -*The learner also has to learn to generalize across various instances of "reds," "blues," and "greens"*	e.g., (q + b) -*The learner may be given recognition practice in which two colored objects (same or different colors) are paired* -*The learner may be asked to indicate whether the examples are the same or different* -*The learner is exposed to multiple and varied examples of each class* -*Finally, he would be required to classify examples presented singly*

G.2.2

EXAMPLES ILLUSTRATING PROGRESSIONS RECOMMENDED FOR PROBLEM: (3 + 4)--"DISCRIMINATIONS + GENERALIZATIONS"--I.E., LEARNING CONCEPTS

EXAMPLES

	CRITERION BEHAVIOR	RECOMMENDED SOLUTIONS
#1	Given letters in a variety of type faces, upper and lower cases, and in script, the "reading" student has to identify each letter. LEARNING PROBLEM -The student has to learn to discriminate between 26 classes of INPUTS, each letter in the alphabet belonging to a different class. -The student has to generalize within each class (i.e., for each letter) across the varieties of typefaces he may encounter; thus, he has to identify an "A" whether it is in upper or lower case, in script, or in a variety of printed typefaces. -Each letter in the alphabet thus is a "class" or "concept," and the learner has to be able to tell the difference between examples belonging to different classes and to see the similarity among examples belonging to the same class.	(b) + (i) + (q) -A principal progression in learning "concepts" involves the use of varied examples. Therefore, the student would be given practice identifying each letter in the varied forms in which it will appear. -This type of practice can be made easier by using recognition practice to begin with. For example, pairs of letters belonging either to different classes or to the same class would be presented and the student would be required merely to indicate whether they are the same or different. Highly similar letters (E and F, for example, or W and M) might be dealt with in this way. -Diagrams can be used in addition. For example, the range of ways each letter might appear could be grouped in a single square (for generalization purposes) and contrasted with other letters in the alphabet in adjacent squares (for discrimination purposes). -Recognition practice could be performed aided by the student's having the diagrams in front of him.

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING THE NATURE OF THE LEARNING PROBLEM AND SOLUTIONS FOR IT

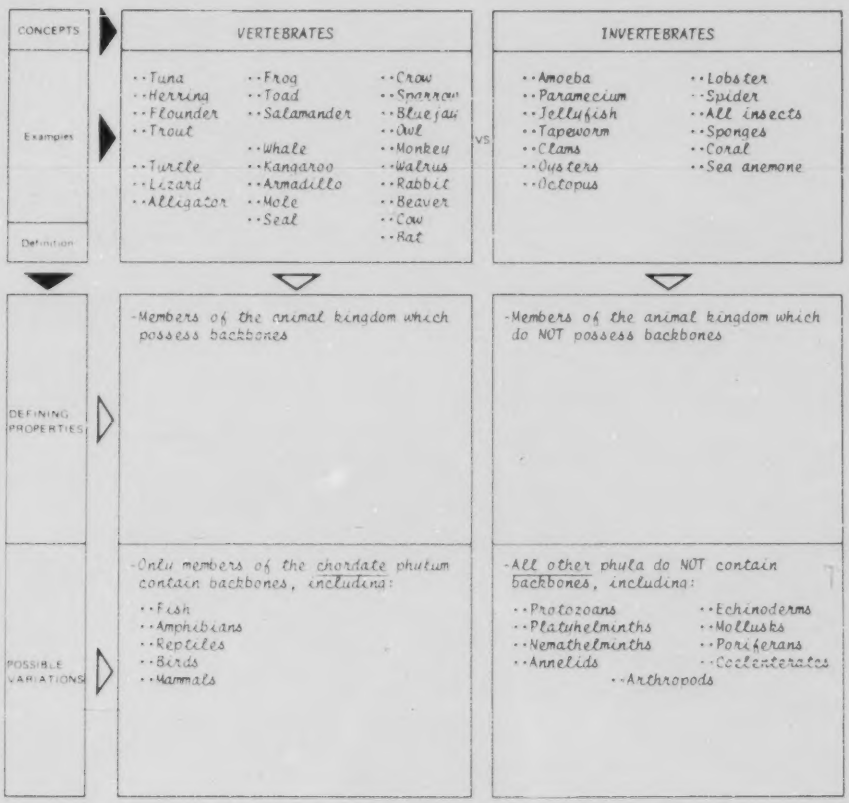
PROBLEM and RECOMMENDED SOLUTIONS	Problem: (3 + 4) X (i)	Available Solution(s): GENERAL: b - i - q
CRITERIA	*(3) Discriminations among INPUTS + (4) Generalizations across INPUTS* *X* *(i) Verbal mode* *i.e., learning of verbal concepts:* *··What belongs to a given class of INPUTS and what is excluded* *··What belongs to related but contrasting classes of INPUTS*	*GENERAL* *b. R-E-P* *i. Diagramming* *q. Varied examples*
EXAMPLES	CLASS INCLUSION AND EXCLUSION *e.g., concept: "prime number"* *-Learning problem is to:* *··Discriminate between what is and is not a prime number* *··Generalize across varied instances of prime numbers* MULTIPLE CLASSES *e.g., concepts: "reinforcement," "punishment," and "extinction"* *-Learning problem is to:* *··Discriminate among examples which belong to each of these three different classes* *··Generalize across varied instances all belonging to the same class*	b. R-E-P *e.g., recognition practice: Given a pair of numbers (one prime, one not), the learner selects the prime number* i. Diagramming *e.g., a diagram with sets of separate squares reserved for each of the three classes; squares can contain definitions, examples, listing of properties, etc.* q. Varied examples *e.g., a succession of practice problems use a variety of examples of each of the three classes (reinforcement, punishment, extinction)*

G.2.2

EXAMPLES ILLUSTRATING PROGRESSIONS USED FOR LEARNING OF VERBAL "CONCEPTS"

EXAMPLES

CRITERION BEHAVIOR	Given the names of animals and verbal descriptions of their characteristics, the learner will correctly classify the examples as "vertebrates" or "invertebrates"
EXAMPLE #1 PREPARATORY PRACTICE PROGRESSION (i) + (q)	First, with the aid of the diagram below, the learner classifies varied examples not appearing in the diagram. Subsequently, he classifies varied examples without the aid of the diagram.
EXAMPLE #2 PREPARATORY PRACTICE PROGRESSION (b)	The learner can be given a recognize-edit-produce sequence; in the "recognition" practice, along with a verbal definition of the concepts serving as a verbal cue (q), he can be given pairs of examples of "vertebrates" and "invertebrates" and be asked to select which is the vertebrate. Subsequently, without any cues at all, he may be given a single example and be asked to classify it.


CONCEPTS
VERTEBRATES
INVERTEBRATES
Examples
··Tuna ··Herring ··Flounder ··Trout ··Turtle ··Lizard ··Alligator
··Frog ··Toad ··Salamander ··Whale ··Kangaroo ··Armadillo ··Mole ··Seal
··Crow ··Sparrow ··Bluejay ··Owl ··Monkey ··Walrus ··Rabbit ··Beaver ··Cow ··Rat
VS.
··Amoeba ··Paramecium ··Jellyfish ··Tapeworm ··Clams ··Oysters ··Octopus
··Lobster ··Spider ··All insects ··Sponges ··Coral ··Sea anemone
Definition
DEFINING PROPERTIES
-Members of the animal kingdom which possess backbones
-Members of the animal kingdom which do NOT possess backbones
POSSIBLE VARIATIONS
-Only members of the chordate phylum contain backbones, including:
··Fish ··Amphibians ··Reptiles ··Birds ··Mammals
-All other phyla do NOT contain backbones, including:
··Protozoans ··Platyhelminths ··Nemathelminths ··Annelids ··Echinoderms ··Molluscs ··Poriferans ··Coelenterates ··Arthropods

G.2.2
IDENTIFICATION
MATRIX

CRITERIA FOR IDENTIFYING LEARNING PROBLEM:
(5) X (c): "MULTIPLE ASSOCIATIONS"

LEARNING PROBLEM and RECOMMENDED SOLUTIONS	PROBLEM (5) X (C) MULTIPLE ASSOCIATIONS	RECOMMENDED SOLUTIONS: General: b. R-E-P; o. Repetition. Specific: i. Diagramming; g. Verbal cues; o. Repetition; p. Review
	-*The learner has to learn to associate INPUTS and ACTIONS and there are a large number of INPUT/ACTION pairs to be learned:* *··INPUTS can be singular (and specific ACTION is to be associated with that INPUT alone)* *··INPUTS can belong to a class (and a specific ACTION is to be associated with all members of the class)* -*The problem is learning "which ACTION goes with which INPUT"*	*o. REPETITION* -*The learner practices pairing INPUT and ACTION on a repeated basis--spaced out during instruction* *p. REVIEW* -*Following the completion of the initial instruction on the "association," the learner is required at spaced intervals to review pairing of INPUTS and ACTIONS* *g. VERBAL CUES* -*The learner is given rules, principles, or mnemonics to aid him in associating which ACTION goes with which INPUT* *For: "b" (R-E-P) and "i" (diagramming), see previous descriptions*

EXAMPLES	e.g., foreign languages -*Associating the foreign language equivalents (ACTION) of English words (INPUTS)* e.g., arithmetic -*Associating a product (ACTION) for all combinations of numbers from 1-9 multiplied by each other (INPUTS)* e.g., electronics -*Associating numbers from 1-10 (ACTION) with ten different colors (INPUTS) to identify resistance values of resistors*	e.g., arithmetic -*At the beginning of a progression for learning the multiplication tables the learner might be given a table with all products listed in the body, and the learner can be required to practice saying out loud or sub-vocally the product for each pair of all the combinations of (1 - 9) X (1 - 9)* -*He would be required to repeat and review this procedure* -*The progression could then go to multiple choice (i.e., recognition practice)--without the aid of the diagram* -*Finally, the student would practice stating products without help (the criterion)*

G.2.2

EXAMPLES ILLUSTRATING PROGRESSIONS RECOMMENDED FOR "MULTIPLE ASSOCIATIONS": (5) X (c)

EXAMPLES

	CRITERION BEHAVIOR	RECOMMENDED SOLUTIONS
#1	The "reading" student has to pronounce the sound of each of the 26 letters in the alphabet. LEARNING PROBLEM -The student has to learn to associate a sound with each letter. -The learning problem: Which sound goes with which letter--for each of the 26 letter-sound pairs.	(o) + (p) -*Principal progressions useful for learning of multiple associations are repetition and review. The learner practices saying the sound of each letter during multiple practice opportunities. Review of this type of practice is also appropriate.* (f) - *Demonstration* -*(Not illustrated on the opposite page) Preceding the practice described above would be a demonstration (by the teacher or by a taped speaker) of the correct sound for each letter.* (b) -*Practice at the recognition level can make the learning of multiple associations easier--e.g., given the letter, the options a student would choose from would consist of alternative sounds.*

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING LEARNING PROBLEM
(6) X (E): "A LONG CHAIN"

LEARNING PROBLEM and RECOMMENDED SOLUTIONS	PROBLEM: (6) X (E) "A LONG CHAIN"	RECOMMENDED SOLUTIONS: General: a. Shaping; f. Demonstration; m. Editing; n. Backward chaining. Specific: a. Shaping; n. Backward Chaining
CRITERIA	-The learner has to learn to produce a long series of associations ••Given an initial INPUT, he produces an ACTION which results in an OUTPUT ••The resulting OUTPUT becomes the INPUT for another ACTION which, in turn, results in another OUTPUT ••This second OUTPUT becomes the INPUT for still another ACTION, etc. ••This continues until the end of the total chain of associations	f. DEMONSTRATION -The chain or part of it is demonstrated for the learner who then practices it himself (demonstration can be live, on film, or in checklist or diagram form) a. SHAPING -The learner practices a small part (ideally as large a part as he can) of the total chain, then proceeds to practice of a larger part--until he is able to practice the whole chain n. BACKWARD CHAINING -The learner practices the last part of the chain; then, the part before that PLUS the last part; and so on, all the way back to the beginning of the chain m. EDITING -The learner practices critiquing a live or recorded performance by someone else (often incorrect), and then practices himself
EXAMPLES	e.g., assembly of a sound* amplifier The learner has to perform all the operations in the correct order e.g., expansion of a binomial* $(x + y)^{10}$ The learner has to learn to perfor perform all the separate steps in the correct order	e.g., expansion of a binomial -The learner could practice imitating the procedures followed in a demonstration OR -He could practice the last step, then the one before that, and then the one before that, and so on OR -He could practice part of the procedure and the increasingly larger parts

*Also involves other learning problems, i.e., discriminations and generalizations.

G.2.2

EXAMPLES ILLUSTRATING PROGRESSIONS
RECOMMENDED FOR "A LONG CHAIN": (6) X (E)

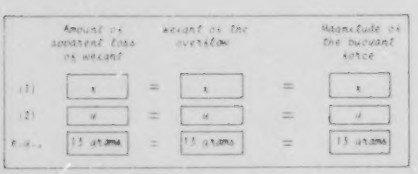
EXAMPLES

	CRITERION BEHAVIOR	RECOMMENDED SOLUTIONS
#1	The student has to recite a poem (or speak a part in a play). LEARNING PROBLEM To learn the entire chain, i.e., speak the words in the correct order.	(o) + (p) -*In addition to other progressions employed, repetition and review are relevant. The type(s) of practice called for by other progressions would be repeated and reviewed.* (6) + (a) -*With the poem (or play) available as a prompt (i.e., demonstration), the student practices the beginning of the poem (a small part of it) and gradually works up to larger and larger portions.* (6) + (n) -*The reverse of the above progression would be to have the student learn the last part (stanza) of a poem; then the next to the last stanza (with the last two then practiced together); and, so on, back to the beginning.*

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING LEARNING PROBLEM: (3 + 4) X (i) + (6): "A CHAIN INVOLVING VERBAL CONCEPTS"

LEARNING PROBLEM and RECOMMENDED SOLUTIONS	PROBLEM: (3 + 4) X (i) + (6) "A CHAIN INVOLVING VERBAL CONCEPTS"	RECOMMENDED SOLUTIONS: Concepts (3 + 4): b. R/E/P; i. Diagramming; q. Varied examples. Chain (6): a. Shaping; n. Backward chaining
CRITERIA	*-The learner has to acquire two or more concepts (if he has not previously learned them); AND* *-He has to learn to chain them appropriately (i.e., to interrelate them as in the learning of a principle)* *-Criterion behavior may consist of:* *··Reproducing the verbal chain verbatim* *··Paraphrasing it* *··Cite examples illustrating it* *··Reproduce the chain when shown an example of it*	*CONCEPTS* *-Each concept in the chain has to be learned using one or more of the above progressions appropriate to concept learning* *CHAIN* *-Depending on the length of the chain and following learning of individual concepts (particularly if they are difficult concepts), the learner might learn to pair (chain) two or more concepts at a time:* *··By shaping* *··By backward chaining* *-The whole chain could be diagrammed*
EXAMPLES	e.g., physics *-The "apparent loss of weight" of a submerged object is equal to "the weight of the displaced fluid" which, in turn, is equal to the weight of the "buoyant force" exerted on the submerged object* *-The learner might be required (shown the change in a scale reading for an object first weighed in air and then in water) to indicate what the buoyant force is*	e.g., physics *-Each concept (in the example in the left-hand column) would require a variety of examples to illustrate it (q)* *-In addition, a diagram (i) or R/E/P (b) type of practice could be used* *-To chain the verbal behavior relating the concepts, a diagram could be used* 

G.2.2

EXAMPLES ILLUSTRATING PROGRESSIONS RECOMMENDED FOR "A CHAIN INVOLVING VERBAL CONCEPTS": (3 + 4) x (i) + (6)

EXAMPLES

	CRITERION BEHAVIOR	RECOMMENDED SOLUTIONS
#1	In his own words, the student has to be able to state the relationship between "ontogeny" and "phylogeny" and to provide examples of the relationship LEARNING PROBLEM -The student has to learn each of the two concepts (i.e., the discriminations and generalizations involved in each); AND -The student has to learn to chain the concepts verbally	(i) + (g) + (b) -*The student can be given a diagram (like the one on page 133) in which each of the two concepts is defined, illustrated with varied examples, and contrasted with the other concept.* -*He can be given R/E/P practice with new examples learning to associate the terms "ontogeny" and "phylogeny" with appropriate examples belonging to each class. The diagram can at first be made available during this type of practice and then removed for subsequent practice.* -*The chaining of verbal behavior comparing, contrasting, or interrelating the two concepts can be accomplished through the use of diagrams, varied examples, and practice at recognition, editing, and production levels.*

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING LEARNING PROBLEM: (3 + 4) + (6) + (7): "PROBLEM-SOLVING" CHAIN

LEARNING PROBLEM and RECOMMENDED SOLUTIONS	PROBLEM: (3 + 4) + (6) + (7): "PROBLEM SOLVING"	RECOMMENDED SOLUTIONS: (3 + 4) Concepts: b. R/E/P; i. Diagramming; q. Varied examples. (7) Action Generalization: g. Verbal cues; h. Visual cues; j. Principles/ procedures. (6) Chain: a. Shaping; f. Demonstration; n. Backward chaining
CRITERIA	-*The learner has to learn to respond to classes of INPUTS which may be:* ••*Verbal* ••*Symbolic* ••*Environmental* -*The ACTION he takes in response to the situations may take two or more forms (ACTION generalization)* -*A chain of such associations is involved*	(See previous sections for discussion of these progressions)
EXAMPLES	e.g., development of instructional materials *Any of the developmental tasks presented in any of the ten HANDBOOK volumes requires the learner to respond in a variety of ways to varied examples belonging to classes of developmental situations; the development tasks involve a chain of such responses* e.g., application of statistical techniques to research problems *Applying appropriate statistical techniques (and alternative techniques) to a variety of types of data bases as a means of testing hypotheses (from selecting the right technique for the situation, through its application, and finally, interpreting results) involves a problem-solving chain*	e.g., application of statistical techniques to research problems *Re: Classes of INPUTS (concepts)* -*Varied examples and recognition respondina could be the progressions used to teach the acquisition of relevant discriminations and generalizations (and the ACTIONS associated with each class)* + *Re: Chains* -*Backward chaining (learning the last part of the procedures (e.a., interpretina results), then the next to the last, etc., could be used*

G.2.2

EXAMPLES ILLUSTRATING PROGRESSIONS RECOMMENDED FOR "PROBLEM-SOLVING" CHAIN

EXAMPLES

	CRITERION BEHAVIOR	RECOMMENDED SOLUTIONS
#1	Troubleshooting of electronic equipment (diagnosis) plus replacement of faulty components [or any other diagnostic performance, e.g., medicine, interpreting radar or oscilloscope displays] LEARNING PROBLEM -The learner has to learn to discriminate between classes of INPUTS and generalize within classes; AND -He has to associate the correct ACTION with each class; AND -He has to proceed to the next set of INPUT-ACTION associations (generated by the OUTPUTS of the first set) and to the next, etc. -Within each set he may have to learn to take alternative ACTIONS (action generalization)	(b) + (i) + (q) -Each portion of the chain devoted to a diagnostic problem (i.e., having to decide to which class of INPUTS a given symptom belongs) can be taught by means of practice with varied examples (as an indispensable element) and the use of diagrams and/or R/E/P (f) + (a) OR (f) + (n) The chaining of the whole operation can be facilitated by demonstrations and either the use of shaping of small portions of the performance in the forward direction, or backward chaining in the reverse direction

DISCUSSION OF THREE KEY TYPES OF
PERFORMANCE REQUIREMENTS AND PROGRESSIONS
FOR DEALING WITH THEM

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The difference between "learning problems" and "performance requirements"	144
Three types of "performance requirements"	145
The difference between "generalization" and "transfer"	146
REQUIREMENT: (1) Transfer vs. recall	147
REQUIREMENT: (2) Delayed basis vs. Immediate basis	148
REQUIREMENT: Recognition vs. production	149

G.2.2

IDENTIFICATION MATRIX

	CRITERIA FOR IDENTIFYING HOW THE CRITERION BEHAVIOR IS DIFFERENTLY CHARACTERIZED WHEN "LEARNING PROBLEMS" AND "PERFORMANCE REQUIREMENTS" ARE IDENTIFIED	
TYPE OF CHARACTERIZATION	LEARNING PROBLEMS -In second column of Section IA on FORM G.1(2) -Identified by numbers (3-7)	PERFORMANCE REQUIREMENTS -In first column of Section IA on FORM G.1(2) -Identified by numbers (1-2)
CRITERIA	*-When learning problems are characterized, the skills which underlie the criterion behavior and which must be learned are being identified* *-Particularly skills which are likely to be relatively difficult to learn are identified* *-The skills include:* *··Discriminations* *··Generalizations* *··Associations* *··Chains*	*-When performance requirements are characterized, the conditions under which the criterion behavior is to be performed are identified:* *··Recall vs. transfer* *··Immediate vs. delayed basis* *··Recognition vs. production*
EXAMPLES	SEE PREVIOUS PAGES	SEE OPPOSITE PAGE

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING THREE KEY TYPES OF "PERFORMANCE REQUIREMENTS" WHICH LEAD TO IMPORTANT PROGRESSION DECISIONS

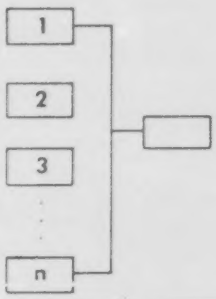
TYPES OF PERFORMANCE REQUIREMENTS	RECALL VS. (1) TRANSFER	IMMEDIATE BASIS VS. (2) DELAYED BASIS	RECOGNITION VS. PRODUCTION
CRITERIA	*RECALL* *-All INPUTS and ACTIONS encountered during practice must be recalled during exhibition of criterion behavior* *-Based on their recall, appropriate discriminations, generalizations, and associations are exhibited* *TRANSFER* *-INPUTS and ACTIONS which have NOT been encountered during practice but which belong to the same class(es) as those which have been encountered must elicit transfer* *-Based on appropriate transfer, correct discriminations, generalizations, and associations will be exhibited*	*IMMEDIATE BASIS* *-Performance of criterion behavior is required immediately upon completion of instruction* *DELAYED BASIS* *-Performance of criterion behavior is required after completion of instruction and after a delay--that can range from months to years*	*RECOGNITION* *-The learner is merely required to select the correct answer (i.e., ACTION to be taken) from options given him* *PRODUCTION* *-The learner is required to produce the answer*
EXAMPLES	e.g., PHYSICS *-The learner has to learn to identify examples of "force" (i.e., discriminate between what is and is not a force--and to generalize across varied examples of "force"* *-The examples he encountered in instruction--he has to recall* *-New examples not encountered in instruction require transfer*	e.g., MATH *-The learner is required to be able to expand the binomial theorem immediately after completing instruction on it and also at the end of the school year--on a final exam*	e.g., ENGLISH *-The learner is required to select from two or more options the example which illustrates a particular figure of speech (e.g., a metaphor)* *-The same learner may be required to cite (produce) an example (previously encountered or not encountered) of a particular type of figure of speech*

G.2.2

IDENTIFICATION MATRIX

CRITERIA FOR DIFFERENTIATING BETWEEN THE LEARNING PROBLEM: "GENERALIZATION" AND THE PERFORMANCE REQUIREMENT, "TRANSFER"

CONCEPT	GENERALIZATION	TRANSFER
CRITERIA	-*The term "generalization" refers to the skill underlying the learning of a concept or class--* ••*Seeing similar INPUTS as belonging to the same class* ••*Seeing similar ACTIONS as belonging to the same class* -*Generalization forms the basis for the learner's taking the same ACTION in response to any instance of the class*	-*Transfer refers to the conditions of performance in which:* ••*Instances belonging to a class have not been encountered during instruction* ••*Transfer to these new instances is required (i.e., the learner must take the same ACTION in response to these instances as to those he has encountered in training* -*Members of the class which the learner has encountered in instruction simply require recall* -*If all members of the class are encountered in instruction, only recall (not transfer) is required* -*Transfer refers to instances requiring generalization which have not been encountered in instruction*
EXAMPLES	e.g., ENGLISH -*The learner has to learn to take ACTIONS appropriate to plural nouns (i.e., using plural verbs)* -*He has to learn to do this to the whole class of plurals he encounters in the criterion situation (generalization)*	e.g., ENGLISH -*During instruction the learner practices only with some plural nouns. For these, he relies on recall in the criterion situation* -*For other examples of plurals not encountered during instruction, he must rely on transfer in the criterion situation*

	SKILL INVOLVED	PRACTICE DURING INSTRUCTION	REQUIREMENT FOR PERFORMANCE
		-Only 1, 2, and 3 are encountered during instruction -4 through n are not encountered	-On a test or in a criterion situation, 1, 2, or 3 need only be recalled -4 through n will require transfer

G.2.2
DECISION
MATRIX

DETERMINING PROGRESSIONS TO USE TO MEET PERFORMANCE REQUIREMENTS: RECALL VS. TRANSFER

CONDITIONS	[1] is not endorsed on FORM G.1(2) RECALL the performance requirement	(1) is endorsed on FORM G.1(2) TRANSFER the performance requirement
ACTION TO TAKE	-*Use progressions routinely recommended to meet the learning problem(s) involved, i.e., for:* *••Discriminations ••Associations* *••Generalizations ••Chains* -*To make recall of encountered INPUTS and ACTIONS involved in these learning problems more likely, in addition, use progressions:* *o. Repetition* *p. Review* *Type of practice selected to meet the particular type of learning problem*	-*Use progressions routinely recommended for:* *••INPUT generalization* *••ACTION generalization* -*In addition, stress progression (q) more heavily* *q. Varied examples* -*For specific transfer problems use:* *e. Procedures/principles* *g. Verbal cues (modes, principles)* *h. Visual cues* *j. Principles (procedures)* *o. Repetition* *p. Review*
EXAMPLES	e.g., BOTANY -*The learner has to be able to identify types of leaves by name (criterion behavior)* -*He practices at recognition level, selecting from pairs of leaves which leaves belong to which classes (for discrimination and generalization purposes)* -*For purposes of recall, he is given sufficient practice (i.e., repetition) so that when he is required to exhibit criterion behavior he can do so* -*During criterion testing, on a recall basis, he can identify a previously encountered leaf--and name it*	e.g., BOTANY -*Not all leaves belonging to each class are encountered during practice* -*To make transfer to these unencountered leaves possible, during criterion testing a sufficient variety of examples from each class should be provided (q)* -*Additionally, some rules for classification might be practiced (g)*

G.2.2
DECISION MATRIX

DETERMINING PROGRESSIONS TO USE TO MEET PERFORMANCE REQUIREMENTS: IMMEDIATE BASIS VS. DELAYED BASIS

CONDITIONS	[2] is not endorsed on FORM G.1(2) IMMEDIATE BASIS the performance requirement	[2] is endorsed on FORM G.1(2) DELAYED BASIS the performance requirement
ACTION TO TAKE	-*To make recall or transfer possible during testing-- immediately following instruction* ••*Use progressions routinely recommended for recall and transfer requirements*	-*To make recall or transfer possible during testing-- on a delayed basis following instruction* ••*Use progressions routinely recommended for recall and transfer requirements* ••*Add further repetition and review* ••*For discrimination and generalization problems, consider (1) diagramming as a technique for insuring delayed recall or transfer*

EXAMPLES	SEE PAGE 147

G.2.2
DECISION MATRIX

DETERMINING PROGRESSIONS TO USE TO MEET PERFORMANCE REQUIREMENTS: RECOGNITION VS. PRODUCTION

CONDITIONS	◉ ☐ Recognition is endorsed on FORM G.1(2) RECOGNITION the performance requirement	☐ Recognition is not endorsed on FORM G.1(2) PRODUCTION the performance requirement
ACTION TO TAKE	*-Use progression: (b) R-E-P* *-Stop at recognition practice; do not require production practice*	*-Require production practice* *-Do not stop at recognition practice (if recognition is used in a progression)*
EXAMPLES	e.g., ARCHITECTURE *-The criterion behavior requires the identification of style at the recognition level (i.e., multiple choice test items)* *-Preparatory practice need only be at the recognition level*	e.g., ARCHITECTURE *-The criterion behavior requires drawings in a particular style; i.e., production of the style* *-Preparatory practice should consist of production practice*

JOB PROCEDURES

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Determining how to fill in Section IIB of FORM G.1(2) - "Designing Preparatory Practice Progressions"	152
Determining information to use in filling in Section IIB of FORM G.1(2)	153
SUMMARY OF PROCEDURES FOR DESIGNING PREPARATORY PRACTICE PROGRESSIONS	154
ADEQUACY OF DESIGN OF PREPARATORY PRACTICE PROGRESSIONS	155

G.2.2

DECISION MATRIX

DETERMINING WHAT INFORMATION TO RECORD IN SECTION IIB ON FORM G.1(2) WHEN "DESIGNING PREPARATORY PRACTICE PROGRESSIONS"

FORMAT OF SECTION IIB	COLUMNS IN SECTION IIB	ROWS IN SECTION IIB
ACTION TO TAKE	*For: Verbal/Symbolic Materials* *Record in each of the three available columns an example using:* *• The actual INPUTS to be given the learner* *• The actual ACTION he is to take* *• The actual OUTPUT he is to produce* *For: Environmental Materials* *Record a description of:* *• INPUTS* *• ACTIONS* *• OUTPUTS*	*1st Row* *Record the first or initial practice problem* *2nd Row* *Intermediate practice problem* *3rd Row* *Practice problem just prior to criterion practice*

EXAMPLE

IIB Design Preparatory Practice Progression — IIC Characterize

PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT	MODE
1st	e.g., "All plurals use the verb 'are.'" Which of these nouns takes "are"? __house __houses	e.g., Checks the correct option	e.g., __house __X houses	INPUTS / OUTPUTS i verbal/symbolic i ii environmental ii iii audio iii iv non-realistic iv v transient v ACTIONS vi perceptual vii motor viii vocal ix subvocal
2nd	e.g., Correct this sentence. "The men is at home."	e.g., Changes the incorrect verb or changes the noun	e.g., "The men are at home" OR "The man is at home"	
3rd	e.g., Write a sentence telling about what is happening in this picture. Use the correct form: "is" or "are."	e.g., Makes up a sentence	e.g., "Is" and/or "are" agree with the verb	

G.2.2

DECISION MATRIX

DETERMINING WHERE TO OBTAIN INFORMATION NEEDED FOR DESIGNING PREPARATORY PRACTICE PROGRESSIONS

INFORMATION NEED	CONTENT of criterion behavior	Selection of relevant PREPARATORY PRACTICE PROGRESSIONS
ACTION TO TAKE	-*For identifying the types of INPUTS, ACTIONS, and OUTPUTS involved in criterion behavior, review:* ••*Task analysis:* *FORM A.5(4) or (11)* ••*Statement of objectives:* *FORM D.2(1)* ••*Criterion test items:* *FORM F.2(1)* ••*Design of criterion practice:* *FORM G.1(2) - Section IB* -*Make INPUTS, ACTIONS, and OUTPUTS in preparatory progression reflect or parallel the criterion behavior (i.e., content, mode, etc.)**	-*Review endorsed (i.e., circled) progressions in Section IIA of FORM G.1(2)* -*Make preparatory progressions reflect the selection*

*Reflects simulation decisions

G.2.2

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN DESIGNING PREPARATORY PRACTICE PROGRESSIONS

#1	#2	#3
a. REVIEW the following materials: ··FORM A.5(4) or (11) (task analysis) ··FORM D.2(1) (statement of objectives) ··FORM F.2(1) (tests) ··FORM G.1(2) - Section IB b. Identify types of INPUTS, ACTIONS, and OUTPUTS involved in criterion behavior c. Review SECTION IIA of FORM G.1(2)	a. In SECTION IIB of FORM G.1(2) prepare initial practice problem in progression and write in actual: a.1 INPUT a.2 ACTION a.3 OUTPUT (or description of them) b. Prepare intermediate sequence in progression problem (where appropriate)	a. Prepare final problem (just prior to criterion practice) in the progression

IIB Design Preparatory Practice Progression

IIC. Characterize

PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT
#2a 1st	#2a·1	#2a·2	#2a·3
#2b 2nd			
#3a 3rd			

MODE	INPUTS	OUTPUTS
verbal/symbolic	i	i
environmental	ii	ii
audio	iii	iii
non-realistic	iv	iv
transient	v	v
ACTIONS		
perceptual	vi	
motor	vii	
vocal	viii	
subvocal	ix	

G.2.2

STANDARDS MATRIX

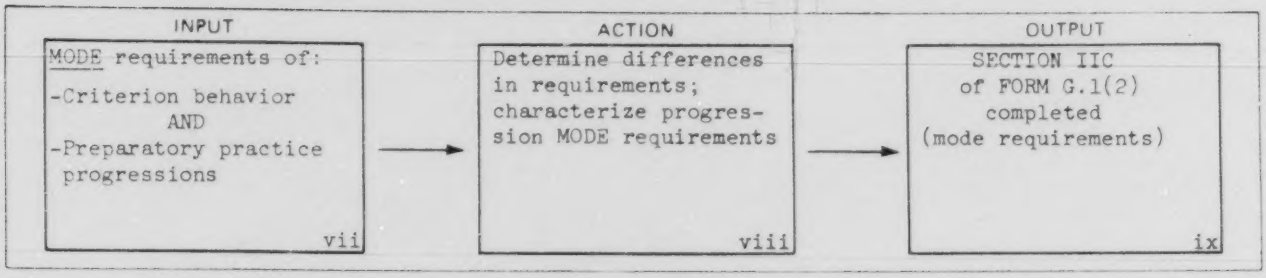
CRITERIA FOR ASSESSING ADEQUACY OF DESIGN OF PREPARATORY PRACTICE PROGRESSIONS

PROPERTIES	COMPLETENESS I	COMPLETENESS II	RELEVANCE
CRITERIA	-*A progression is recorded identifying:* ••*The type of initial practice* ••*The type of intermediate practice (where more than two types are involved)* ••*The type of final, pre-criterion practice*	-*An identification is made of:* ••*INPUTS* ••*ACTIONS* ••*OUTPUTS*	-*The content of the designed progressions reflects the type of criterion behavior (or planned simulation of it) involved* *PLUS* -*The progressions reflect the decisions made in Sub-STEP G.2(1) (selection of progressions)*

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*The endorsement of the mode requirements of the preparatory practice progressions which have been developed.*
WHAT YOU WILL WORK FROM	(1) Mode requirements of the criterion behavior identified by endorsements in MODE column in section IA of FORM G.1(2). (2) Descriptions of INPUTS, ACTIONS, and OUTPUTS in section IIB of FORM G.1(2) which presents the preparatory practice progressions.
WHAT YOU WILL DO	(1) Compare the mode requirements of the criterion behavior and of the preparatory practice progressions; (2) (If different) endorse the mode requirements of the latter in section IIC of FORM G.1(2).
FORMS YOU WILL USE	FORM G.1(2) -- section IIC -- for characterizing mode requirements of the selected preparatory practice progression(s).

DESCRIPTION OF Sub-STEP	G.2.3



Job Aid Contents

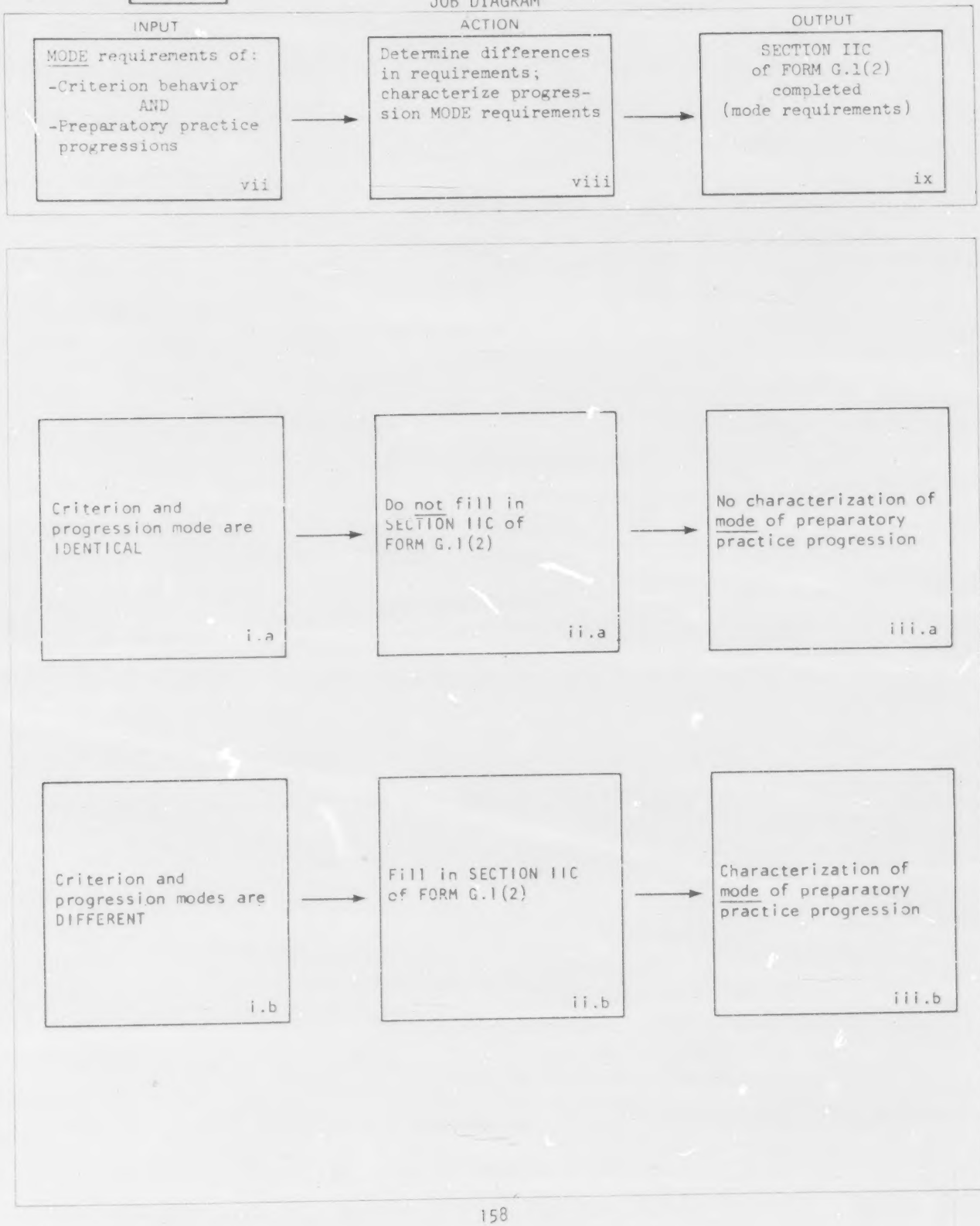
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: When criterion and progression modes are likely to differ . . . 162	-MATRIX: When to use SECTION IIC of FORM G.1(2) . . 161	-MATRIX: Adequacy of characterization of mode requirements . 165	SECTION IIC of FORM G.1(2) SUMMARY OF PROCEDURES . . .164

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		SECTIONS IA and IIB of FORM G.1(2) (carried forward from)	G.2.2	SECTION IIC of FORM G.1(2)

Sub-STEP G.2.3

JOB DIAGRAM



BACKGROUND INFORMATION

	page
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When Section IIC needs to be or need not be used	161
Identifying situations likely to call for use of Section IIC	162

G.2.3

ILLUSTRATION SHOWING SECTION IIC OF FORM G.1(2) AVAILABLE FOR:
CHARACTERIZING MODE OF PREPARATORY PRACTICE PROGRESSIONS

IIB. Design Preparatory Practice Progression

* IIC. Characterize

PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT	MODE
1st				INPUTS / OUTPUTS I verbal/symbolic I II environmental II III audio III
2nd				IV non-realistic IV V transient V ACTIONS
3rd				VI perceptual VII motor VIII vocal IX subvocal

G.2.3
DECISION
MATRIX

DETERMINING WHEN TO USE AND WHEN NOT TO USE SECTION IIC OF FORM G.1(2)		
CONDITIONS	MODE of Preparatory Practice Progressions is IDENTICAL to mode of criterion practice	MODE of Preparatory Practice Progressions DIFFERS FROM mode of criterion practice
ACTION TO TAKE	*-Omit use of SECTION IIC*	*-Use SECTION IIC to characterize the MODE(S) of preparatory practice progressions*

G.2.3

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING PROGRESSIONS LIKELY TO INVOLVE MODE(S) DIFFERING FROM THOSE IN CRITERION PRACTICE

TYPES OF PROGRESSIONS	Progressions LIKELY to involve different modes from those found in criterion practice	Progressions NOT LIKELY to involve different modes from those found in criterion practice
CRITERIA	*-Switches in INPUTS among:* *i. verbal/symbolic* *ii. environmental* *iii. audio* *iv. non-realistic* *v. transient* *-Switches in ACTIONS among:* *vi. perceptual* *vii. motor* *viii. vocal* *ix. subvocal*	*-No switches in INPUTS among:* *i. verbal/symbolic* *ii. environmental* *iii. audio* *iv. non-realistic* *v. transient* *-No switches in ACTIONS among:* *vi. perceptual* *vii. motor* *viii. vocal* *ix. subvocal*
EXAMPLES	MODE c. visual/verbal e. procedures/principles PROMPTING/FADING g. verbal cues h. visual cues i. diagramming CONTENT j. principles/procedures m. editing/criterion	UNIT SIZE a. shaping MODE b. R/E/P d. concrete/abstract PROMPTING/FADING f. examples or demonstrations CONTENT k. altered criterion/criterion l. errors/criterion n. backward chaining FREQUENCY OR VARIATIONS o. repetition p. review q. varied examples

JOB PROCEDURES

	page
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ADEQUACY OF CHARACTERIZATION	165

G.2.3

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN CHARACTERIZATION OF MODE OF PREPARATORY PRACTICE PROGRESSIONS

#1

a. Review the characterization of the MODE of criterion practice in SECTION IA of FORM G.1(2)

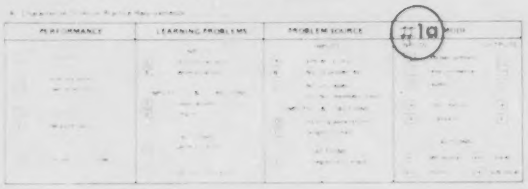
b. Review the preparatory practice progressions designed in SECTION IIB of FORM G.1(2)

c. Identify differences in mode as between (a) and (b)

#2

a. If there is a difference in mode as between #1a and #1b, characterize the mode of the preparatory practice progression in SECTION IIC of FORM G.1(2)

b. If there is no difference, do not fill in SECTION IIC

SECTION IA

SECTIONS IIB AND IIC

G.2.3
STANDARDS
MATRIX

CRITERIA FOR ASSESSING THE ADEQUACY OF THE CHARACTERIZATION OF THE MODE OF PREPARATORY PRACTICE PROGRESSIONS

PROPERTIES	COMPLETENESS	RELEVANCE
CRITERIA	-*Mode characterization is provided for all three:* ••*INPUTS* ••*OUTPUTS* ••*ACTIONS*	-*Mode characterization reflects the nature of the INPUTS, ACTIONS, and OUTPUTS which appear in the progressions designed and recorded in SECTION IIB of FORM G.1(2)*

STEP G.2

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
G.2.1		Selected preparatory practice progression(s) appropriate to criterion practice requirements		SECTION IIA of FORM G.1(2)
G.2.2			Designed sample preparatory progressions	SECTION IIB of FORM G.1(2)
G.2.3	Identified mode involved in preparatory practice progression(s)			SECTION IIC (mode) of FORM G.1(2)

STEP G.3

G.3 Plan behavior control.

G.3.1 Identify prompts to be used in directing or controlling observation and/or attention.

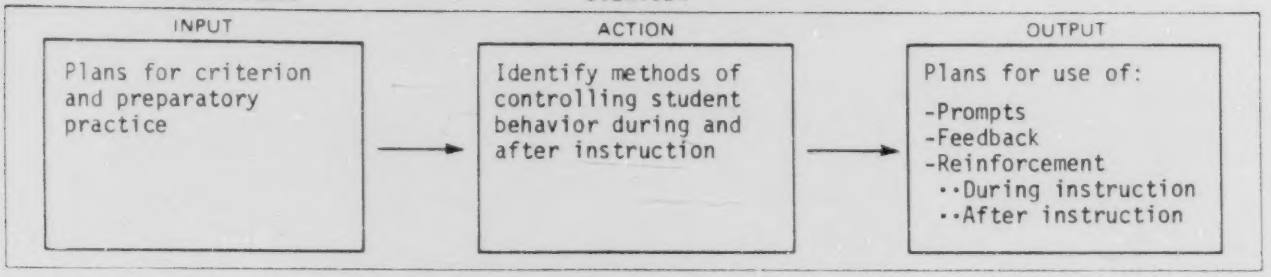
G.3.2 Identify methods for providing feedback to student as to the correctness of the outputs he has produced.

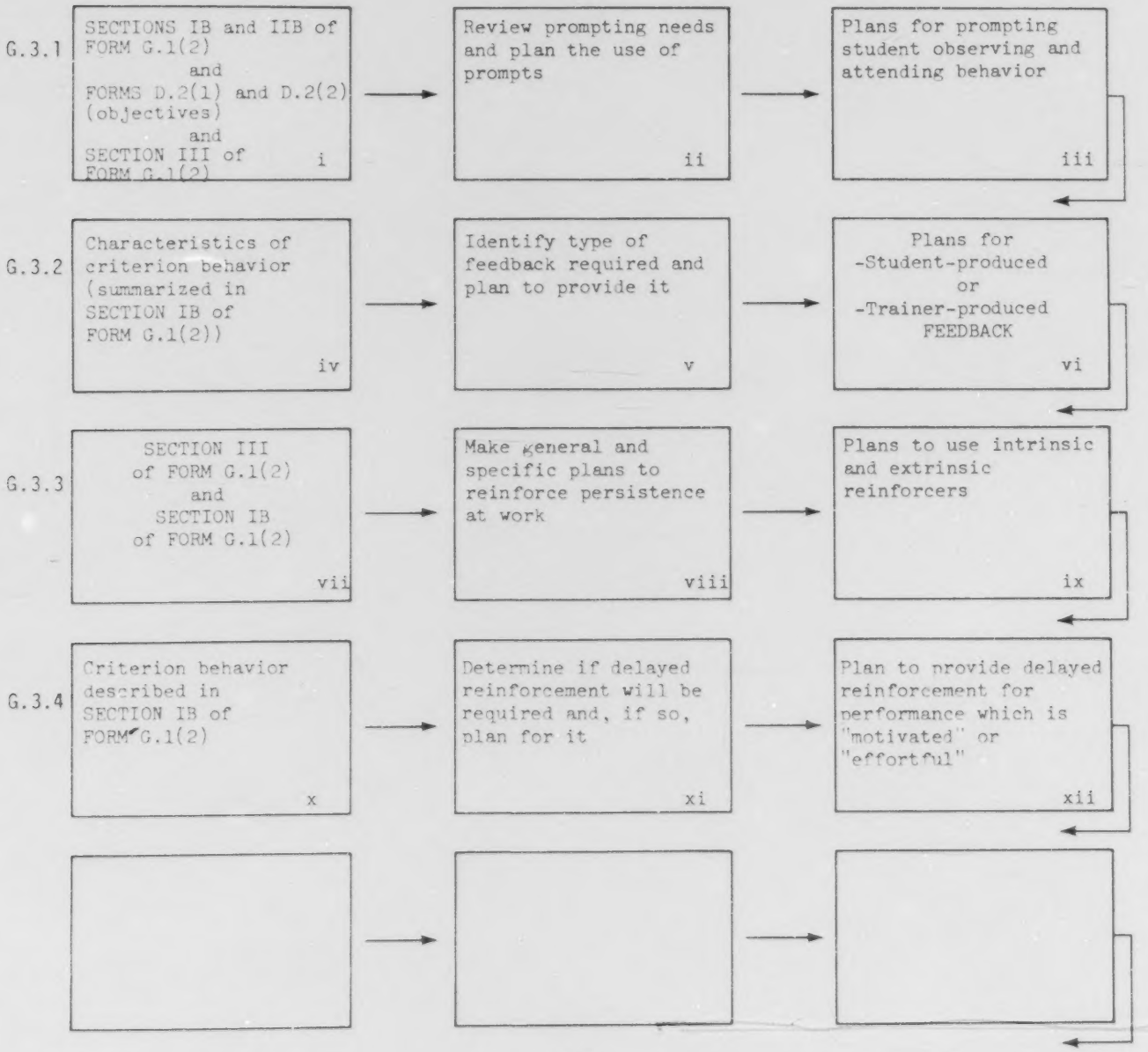
G.3.3 Identify methods for reinforcing the student for perseverance at practice.

G.3.4 Identify methods for making reinforcers available to maintain performance beyond the instructional setting.

STEP G.3

OVERVIEW





STEP G.3

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BACKGROUND INFORMATION
FOR ENTIRE STEP G.3

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Two goals in instruction: Behavior change and behavior maintenance	172
Four key elements involved in changing and maintaining behavior	173

G.3

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING TWO INSTRUCTIONAL GOALS: BEHAVIOR CHANGE AND BEHAVIOR MAINTENANCE

TYPES OF GOALS	Behavior CHANGE	Behavior MAINTENANCE
CRITERIA	-*Providing for student acquisition of a behavior repertoire (specified by objectives) which the student did not previously possess, involving:* ••*Discriminations* ••*Generalizations* ••*Associations* ••*Chains* -*Providing for student acquisition of the behavior repertoire at a higher strength (i.e., less likely to be forgotten)*	-*Providing for the maintenance of a newly acquired behavior repertoire at a prescribed level of strength--beyond the instructional period*
EXAMPLES	e.g., teacher performance -*The teacher learns to use reinforcement procedures in managing classroom behavior (skills she did not possess before training)*	e.g., teacher performance -*The teacher continues to use these techniques consistently and correctly after completion of training (rather than drifting back to previously used techniques, punishment, for example*

G.3

IDENTIFICATION MATRIX

FOUR KEY INSTRUCTIONAL/MANAGEMENT OPERATIONS REQUIRED TO CHANGE AND MAINTAIN BEHAVIOR

OPERATIONS	PROMPTING	PROVIDING FEEDBACK	PROVIDING REINFORCEMENT DURING INSTRUCTION	PROVIDING REINFORCEMENT POST INSTRUCTION
CRITERIA	-*Devices or procedures to direct student attention or observing behavior to:* ··*What it is he is expected to learn* ··*Features of a presentation relevant to what he is to learn* ··*What he is expected to do during practice*	-*Devices or procedures are used to provide feedback to the student after he has practiced criterion or preparatory behaviors regarding:* ··*The correctness or incorrectness of what he has practiced* ··*The completion or non-completion of what he has practiced*	-*Devices or procedures are used during instruction to reinforce students during practice in order to:* ··*Insure that the student will continue to persist in practicing (since he learns only what he practices)*	-*Devices or procedures are used after completion of instruction in order to:* ··*Insure that the student will continue to exhibit the behavior he has learned--beyond the training or instructional setting*

EXAMPLES	SEE SUBSEQUENT SUB-STEP SECTIONS DEVOTED TO EACH OF THE FOUR OPERATIONS

*SECTION III
OF FORM G.1(2)

(See opposite page)

Section III of FORM G.1(2) is available as a checklist reminder of:

- The four instructional/management operations to be performed
- Specific ways to perform them

Form G 1(2)

LESSON [ ] CRITERION BEHAVIOR [ ]

A. Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
[ ] simultaneous [ ] successive [ ] adjacent [ ] two-directional [1] transfer [2] delayed recall [ ] recognition mode	INPUTS [3] discriminations [4] generalizations INPUTS & ACTIONS [5] associations [6] chains ACTIONS [7] generalizations [ ] partial proficiency	INPUTS [A] similarity (dis-) [B] No. of properties [C] No. of classes (or: No. members/class) INPUTS & ACTIONS [D] existing associations [E] length of chain ACTIONS [F] integrative strength	INPUTS / OUTPUTS [i] verbal/symbolic / [i] [ii] environmental / [ii] [iii] audio / [iii] [iv] non-realistic / [iv] [v] transient / [v] ACTIONS [vi] perceptual / [viii] vocal [vii] motor / [ix] sub-vocal

IA. Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a. shaping gradual increases in: quantity quality	b. R/E/P c. visual/verbal d. concrete/abstract e. procedures/principles	f. examples or demonstrations g. verbal cues h. visual cues i. diagramming, overviews	j. principles/procedures k. altered criterion/criterion l. errors/criterion m. editing/criterion n. backward chaining	o. repetition p. review q. varied examples

		2	A	B	C	D	E	F	*i*	*vi*	*vii*
1	a	o-p	q	q				g-j	e	h	j
3	b-q	r-o-p	g-h-k	r-g	r					h	
4	b-q	r-o-p	g-h	r-q	r-q				g	h	j
3+4	b-q	r-o-p	g-h	r-g	r-g				e-d-e-i		
5	b-o	r-o-p			r-g-o-p	b-g-l					
6	a-f-m-n	o-p					a-n				a-m-n
7	i	o-p						g-h-j			j

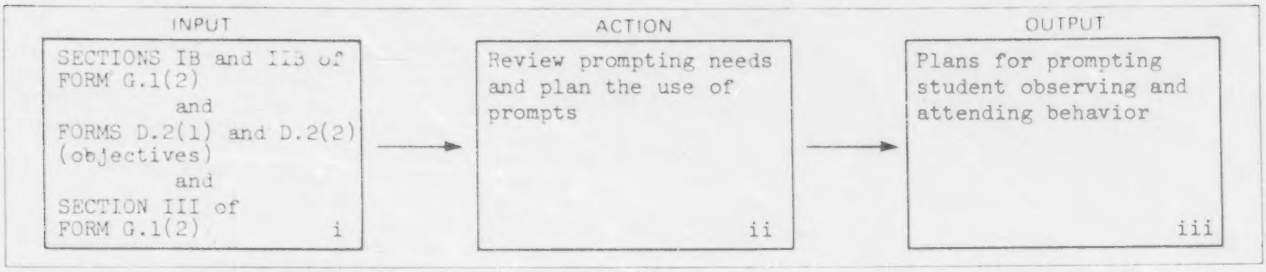
III. Plan Behavior Control

PROMPT • OBSERVATION • ATTENTION	PROVIDE FEEDBACK	REINFORCE PRACTICE	PROVIDE DELAYED REINFORCEMENT
Advance Organizers statement of objectives instructions *Cues* visual or verbal formats, diagrams checklists	*Correctness of Answers (Solutions)* standard available for comparison discrimination practice re. correct outputs	*Intrinsic Reinforcers* interesting materials *Extrinsic Reinforcers* social monetary activities grades	*Extrinsic Reinforcers* social monetary activities

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Plans to prompt student's attending/observing behavior and the practice of both criterion and preparatory behaviors with:* *... statements of objectives* *... instructions* *... visual/verbal cues*
WHAT YOU WILL WORK FROM	(1) Descriptions in sections IB and IIB of FORM G.1(2) of the behaviors to be practiced. (2) Statements of objectives for you the developer and for your students.
WHAT YOU WILL DO	(1) Review the plans for instructional materials for need to prompt observing and attending behavior as well as the behavior students are expected to practice. (2) Plan the prompts you will use.
FORMS YOU WILL USE	FORM G.1(2) -- section III -- column #1: "PROMPT OBSERVATION/ATTENTION" which serves as a reminder to plan for these necessary functions.

DESCRIPTION OF Sub-STEP	G.3.1



Job Aid Contents

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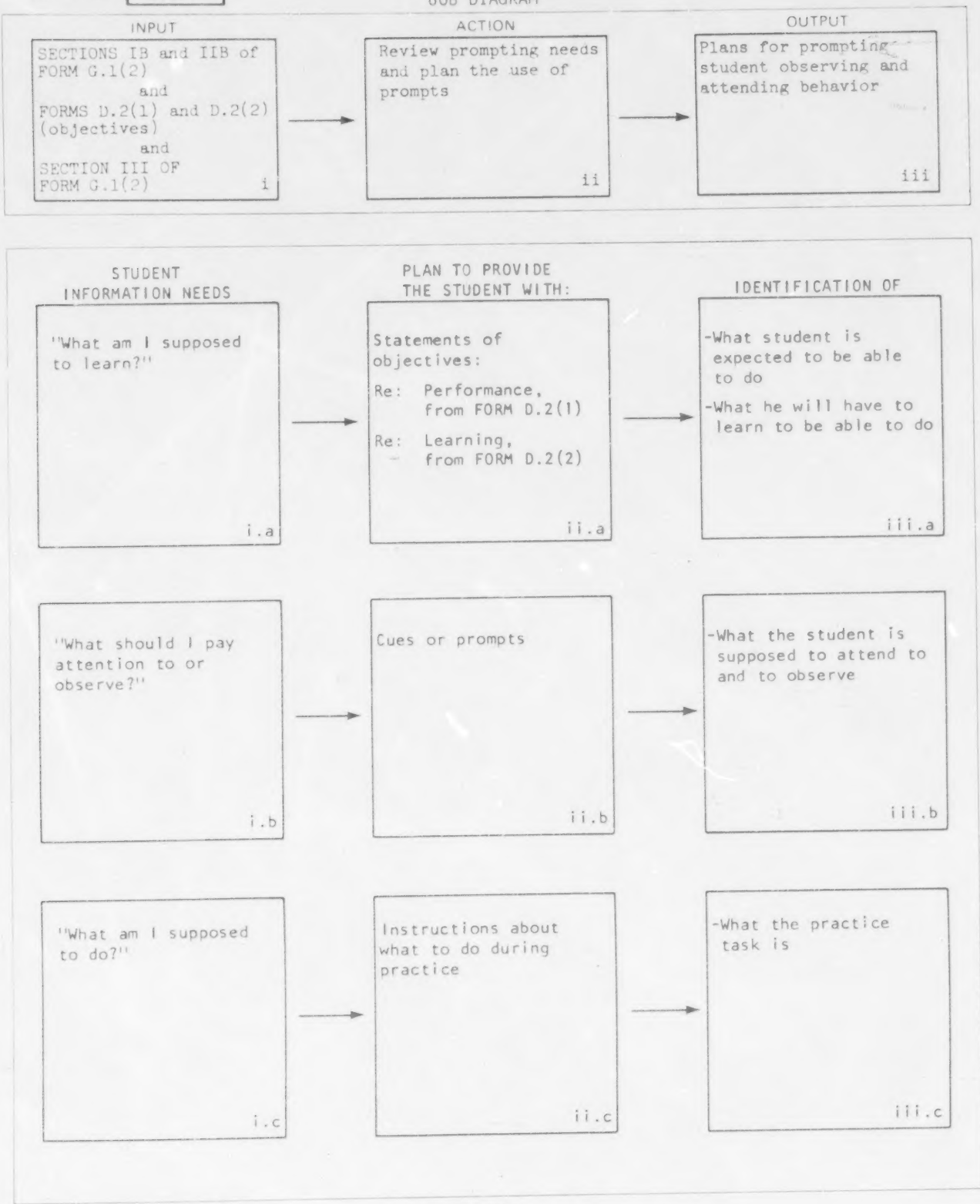
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		SECTIONS IB and IIB of FORM G.1(2) (carried forward from)	G.2.3	
		FORMS D.2(1) and D.2(2) (carried forward from)	G.2.3	

Sub-STEP G.3.1

JOB DIAGRAM



BACKGROUND INFORMATION

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*SECTION III of FORM G.1(2): "PROMPT: OBSERVATION/ATTENTION" A checklist reminder	180
Information students need to have	181
How to use prompts to provide students with relevant information	182

Form G-1(2)

LESSON ☐ CRITERION BEHAVIOR ☐

IA Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ simulation ☐ job-available ☐ two directions 1 number 2 delayed recall ☐ recognition mode	INPUTS 3 discriminations 4 generalizations INPUTS & ACTIONS 5 associations 6 chains ACTIONS 7 generalizations ☐ partial proficiency	INPUTS A similarity (dis-) B No. of properties C No. of classes (or, No. members/class) INPUTS & ACTIONS D existing associations E length of chain ACTIONS F integrative strength	INPUTS / OUTPUTS i verbal/symbolic — i ii environmental — ii iii audio — iii iv non-realistic — iv v transient — v ACTIONS vi perceptual — viii vocal vii motor — ix sub-vocal

IIA Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a shaping gradual increases in: quantity quality	b R/E/P c visual/verbal d concrete/abstract e procedures/principles	f examples or demonstrations g verbal cues h visual cues i diagramming, overviews	j principles/procedures k altered criterion/criterion l errors/criterion m editing/criterion n backward chaining	o repetition p review q varied examples

		2	A	B	C	D	E	F	i	vi	vii
1	q	o p	g	g				q i	e	h	i
3	b q	i o p	g h k	i q	i					h	
4	b q	i o p	g h	i q	i q				g	h	i
3+4	b i q	i o p	g h	i q	i g				c g e i		
5	b o	i o p			i g o p	b q i					
6	a f m n	o p					s i				a m n
7	j	o p						g h j			j

III Plan Behavior Control

*PROMPT • OBSERVATION • ATTENTION	PROVIDE FEEDBACK	REINFORCE PRACTICE	PROVIDE DELAYED REINFORCEMENT
Advance Organizers statement of objectives instructions *Cues* visual or verbal formats, diagrams checklists	*Correctness of Answers (Solutions)* standard available for comparison discrimination practice irrelevant outputs	*Intrinsic Reinforcers* interesting materials *Extrinsic Reinforcers* social monetary activities grades	*Extrinsic Reinforcers* social monetary activities

G.3.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING WHAT THE STUDENT NEEDS TO KNOW ABOUT THE INSTRUCTIONAL MATERIALS OR PROCEDURES HE USES

STUDENT INFORMATION NEEDS	What am I supposed to learn?	What should I pay attention to or observe?	What am I supposed to do?
CRITERIA	-*The student needs to know:* ••*What he is expected to be able to do after completing instruction* ••*What he is expected to be able to do as preparation for the (above) final goal* ••*The student needs to know what he must learn in order to be able to perform (or do) as expected*	-*The student needs to know:* ••*What specifically he should he should pay attention* ••*What specifically he should observe at any particular point in time*	-*The student needs to know:* ••*What he is expected to do or perform during practice*
	-*The student needs to know what he can consider as:* ••*Noise* ••*Redundancy* ••*Irrelevancy*		
EXAMPLES	e.g., speak Mandarin Chinese *The student needs to know that he has to learn to pronounce four tones in Mandarin Chinese correctly; and to do so he will have to be able to tell the difference (i.e., discriminate) between the four tones*	e.g., when provided with a diagram *The student needs to know the order or sequence and in which columns and rows are to be entered and read* e.g., when watching a filmed demonstration *The student needs to know what the essential parts of the demonstration are he should be paying attention to and what can be ignored (completely or just at a particular moment)*	e.g., given a math practice problem *The student needs to know if he is required to show his work or just an answer* e.g., given any kind of practice problem *The student needs to know if he is expected to compare his answer with a standard and/or if he is expected to do anything about an incorrect answer*

G.3.1

DETERMINING HOW TO FULFILL STUDENT INFORMATION NEEDS

DECISION MATRIX

CONDITIONS	Need for information regarding: WHAT HAS TO BE LEARNED	Need for information regarding: PAID ATTENTION TO OR OBSERVED	Need for information regarding: SHOULD BE DONE
ACTION TO TAKE	-*Plan to provide the student with a statement of objectives before he begins an instructional unit* ••*The statement of objectives prepared for your use on FORM D.2(1) (or a paraphrase of it)* ••*The statement of learning objectives prepared for the student on FORM D.2(2)*	-*Plan the use of verbal cues directing attention or observation* ••*Printed or oral statements identifying what should be attended to or observed* ••*Checklists identifying what should be attended to and the order in which it should be attended to* ••*Headings or numbering systems* -*Plan the use of visual cues directing attention or observation* ••*Diagrams, formats* ••*Arrows, pointers* ••*Color-coding*	-*Plan to give the student instructions as to what he is required to do during practice*
EXAMPLES	e.g., math -"*You will be able to expand the binomial theorem*" -"*In order to be able to do this, you will have to learn the proper sequence of steps, and what to do in each step (i.e., what members to multiply)*"	e.g., physics -*During a filmed demonstration of Archimedes' Principle, the student's attention to the change in apparent weight of an object (weighed in air and in water) can be directed to the scale readings by any of the following:* ••*Oral instructions* ••*Use of a pointer* ••*Close-up of the scale face*	e.g., English -*The student is instructed to make changes correcting incorrect punctuation in a paragraph*

JOB PROCEDURES

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SUMMARY OF PROCEDURES	186
Adequacy of plans for the use of prompts designed to control student attention and observation	187

G.3.1

IDENTIFICATION MATRIX

	CRITERIA FOR IDENTIFYING WHEN THREE TYPES OF INFORMATION ARE LIKELY TO BE NEEDED		
TYPE OF INFORMATION STUDENTS NEED	When does the student need to know: "What am I supposed to learn?"	When does the student need to know: "What should I pay attention to or observe?"	When does the student need to know: "What am I supposed to do?"
CRITERIA	-*ALWAYS*	-*When materials are:* ••*Dense and contain much relevant information which has to be dealt with at different times* ••*Dense and contain much irrelevant information* ••*Complex, difficult* ••*Voluminous*	-*ALWAYS*
EXAMPLES		e.g., FILMS ••*The number of objects, people, or events is large* ••*There is much going on at the same time* e.g., PRINTED MATERIALS ••*Long, printed passages*	

G.3.1

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN PLANNING THE USE OF PROMPTS TO CONTROL OBSERVATION AND ATTENTION

a. Review SECTION III (Prompt Observation and Attention) of FORM G.1(2) as a checklist reminder of optional and required prompts

- Required prompts
  - Statement of objectives
  - Instructions
- Optional prompts
  - Cues

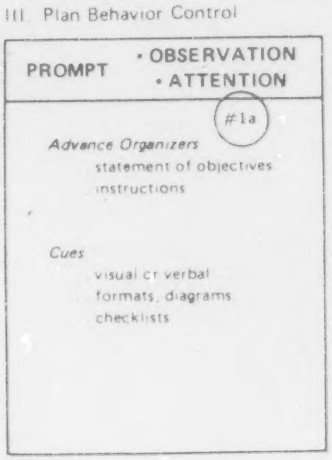
b. Plan the use of FORM D.2(1) and FORM D.2(2) as a basis for statements of objectives to be given students

a. Review SECTIONS IB and IIB of FORM G.1(2) to identify the need for:
   - Instructions to be given students
   - Special cues to direct student attention or observing behavior to specific features or portions of instructional materials

b. Plan (and develop*) instructions and cues

Development may be deferred until TASK H when the instructional materials themselves are actually prepared.

SECTION III of FORM G.1(2)



SECTIONS IB and IIB of FORM G.1(2)

G.3.1
STANDARDS
MATRIX

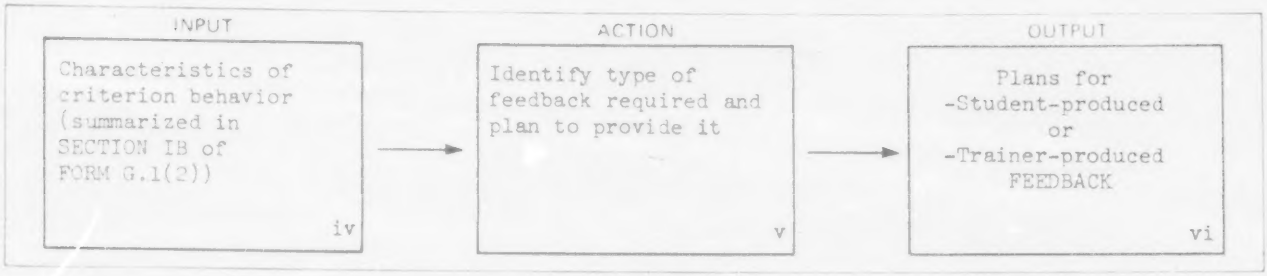
CRITERIA FOR ASSESSING THE ADEQUACY
OF IDENTIFICATION OF PROMPTS TO BE USED

PROPERTIES	COMPLETENESS	RELEVANCE
CRITERIA	-*Planning the types of prompts to be given the student included a consideration of:* ••*Statements of performance objectives* ••*Statements of learning objectives* ••*Instructions as to what to do during practice* ••*Visual or verbal cues directing the student's attending or observing behavior*	-*Prompts selected or devised are appropriate for the task of informing the student of:* ••*What he is expected to learn from instructional materials or procedures* ••*What features or properties of the materials he is expected to attend to or observe at any particular time* ••*What he is expected to do or perform during practice*

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Plans for either or both of two types of feedback: Student produced or trainer produced.*
WHAT YOU WILL WORK FROM	(1) Characterization of the criterion behavior as to type, length, and complexity.
WHAT YOU WILL DO	(1) Identify the type of feedback appropriate to the type of criterion behavior. (2) Design the feedback you will provide.
FORMS YOU WILL USE	FORM G.1(2) -- section III -- column #2: "PROVIDE FEEDBACK" -- which serves as a reminder of the need to plan for feedback to students.

DESCRIPTION OF Sub-STEP	G.3.2



Job Aid Contents

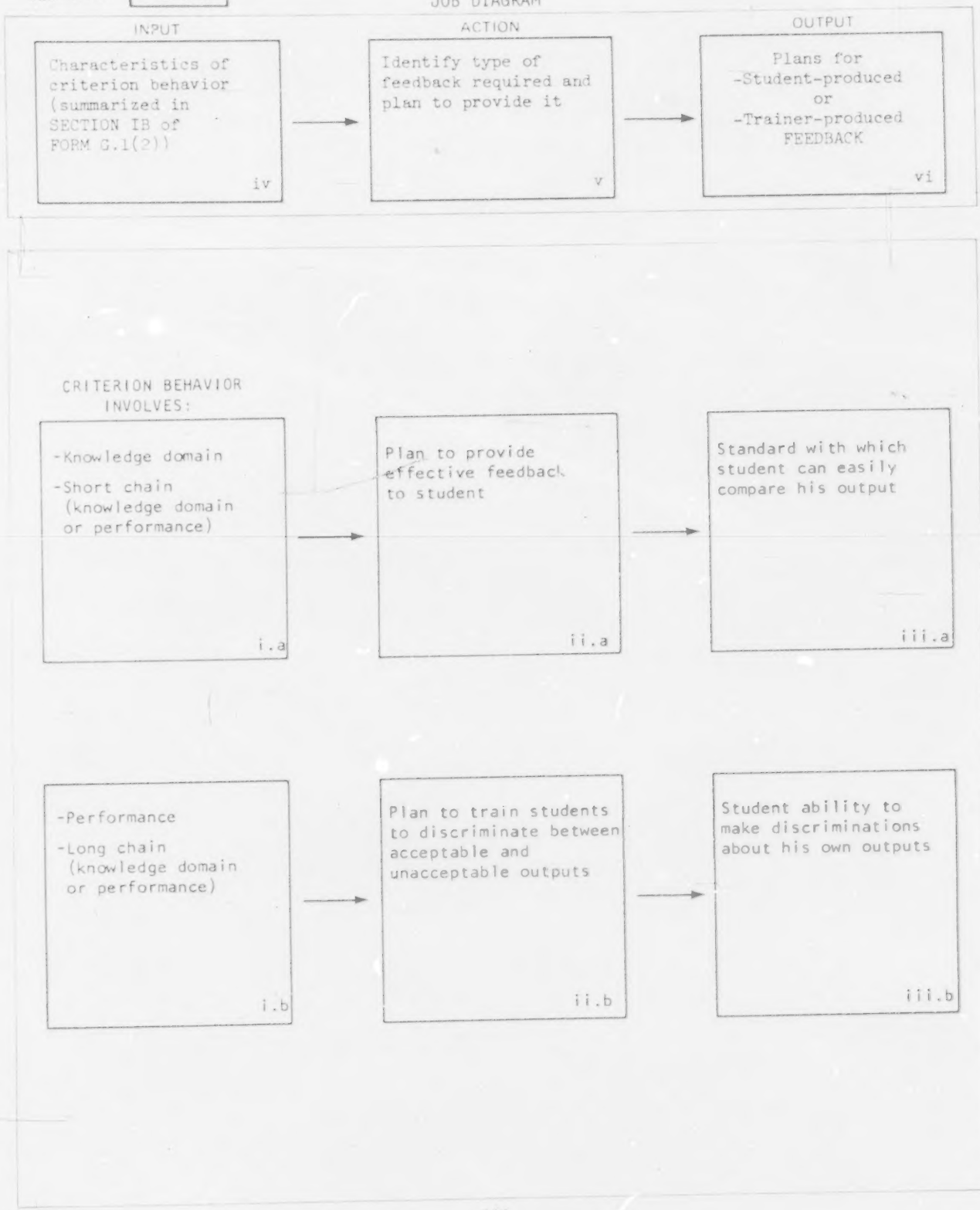
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Types and functions of feedback . . 191-194 -MATRIX: Desirable properties of feedback . .195, 196 -MATRIX: When each type of feedback is likely to be required 198	-MATRIX: How to provide feedback 199	-MATRIX: Adequacy of plans for providing feedback 201	SECTION III of FORM G.1(2) SUMMARY OF PROCEDURES 200

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		SECTION IB of FORM G.1(2) (carried forward from)	G.3.1	

Sub-STEP G.3.2

JOB DIAGRAM



BACKGROUND INFORMATION

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* SECTION III OF FORM G.1(2): "PROVIDE FEEDBACK" A checklist reminder	192
What functions "feedback" serves	193
Two sources of feedback	194
Desirable properties of feedback	195

Form C-1(2)

LESSON ☐ CRITERION BEHAVIOR ☐

IIA Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ identification ☐ one direction ☐ two directions 1 discrete 2 relational/chain ☐ interpretive/ mode	INPUTS 3 discriminations 4 generalizations INPUTS & ACTIONS 5 associations 6 chains ACTIONS 7 generalizations ☐ partial proficiency	INPUTS A similarity (dist) B No. of properties C No. of classes (or Nrc members/class) INPUTS & ACTIONS D existing associations E length of chain ACTIONS F integrative strength	INPUTS OUTPUTS i verbal/symbolic i ii environmental ii iii audio iii iv non realistic iv v transient v ACTIONS vi perceptual viii vocal viii motor ix sub vocal

IIA Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a shaping/gradual increases quantity quality	b R E P c visual/verbal d concrete/abstract e procedures/principles	f examples or demonstrations g verbal cues h visual cues i diagramming, overviews	j principles/procedures k altered criterion/ criterion l errors/criterion m editing/criterion n backward chaining	o repetition p review q varied examples

		2	A	B	C	D	E	F	v	vi	vii
1	q	o p	g	g				g i	e	h	i
3	b q	i o p	g h k	i g	i					h	
4	b q	i o p	g h	i g	i g				g	h	i
3+4	b i q	i o p	g h	i g	i g				d e i		
5	b o	i o p			i g o p	b g i					
6	a f m n	o p					a n				a m n
7	j	o p						g h i			j

III Plan Behavior Control

PROMPT • OBSERVATION • ATTENTION	*PROVIDE FEEDBACK	REINFORCE PRACTICE	PROVIDE DELAYED REINFORCEMENT
Advance Organizers statement of objectives instructions *Cues* visual or verbal formats, diagrams checklists	*Correctness of Answers (Solutions)* standard available for comparison during simulation practice with correct outputs	*Intrinsic Reinforcers* interesting materials *Extrinsic Reinforcers* social monetary activities grades	*Extrinsic Reinforcers* social monetary activities

G.3.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING FUNCTIONS SERVED BY FEEDBACK PROVIDED TO THE LEARNER

FUNCTIONS OF FEEDBACK	Indicates CORRECTNESS OR INCORRECTNESS of practice	Indicates the NATURE OF ERRORS made in practice
CRITERIA	-*Feedback informs the learner that the answer or solution he has produced or that the action he has taken is either:* ••*Correct, OR* ••*Incorrect* -*The information enables him to decide whether to do one or more of the following:* ••*Review materials he has just covered* ••*Seek remedial practice to be on the lookout for possibility of continued errors in subsequent, new practice situations*	-*Feedback informs the learner of the precise nature of his errors (when he has made them) by:* ••*Providing a standard against which he can judge or evaluate his own performance* ••*Identifying the nature of commonly made errors*
EXAMPLES	e.g., oral English language practice *A taped lesson provides the correct answer--on tape--which is presented following the opportunity the student has to practice using the verb "to be" with a variety of subjects. "If you said 'He is going to work,' you are correct."*	e.g., practice in drawing architectural drawings *Following practice involving a problem in drawing of drawings the student is given a model drawing which enables him to see where and how his drawing has deviated from the "correct" version*

G.3.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING TWO SOURCES OF FEEDBACK

SOURCES OF FEEDBACK	TRAINER or INSTRUCTOR produced	STUDENT produced
CRITERIA	-*Following a practice problem or a practice unit, the training materials themselves provide:* ··*A correct answer/solution* ··*A standard or model product* -*The student compares his own output with the correct or ideal output provided him*	-*The completion of a practice problem or procedure results in an OUTPUT* -*The student himself, without the aid of a standard, makes the discrimination whether the OUTPUT is acceptable/correct*
EXAMPLES	e.g., MATH -*The student is given a problem requiring him to expand the binomial:* $(x + y)^2$ -*Following the student's solution of the problem, he is provided the correct answer:* $x^2 + 2 \times y + y^2$	e.g., THREADING A FILM PROJECTOR -*Following the completion of portions of the threading procedures (e.g., taking loops, drawing film around drums with suitable tightness), the student makes discriminations about the adequacy of the partial output he has produced**

**One of the requirements in the design of training is to prepare him to be able to make the relevant discriminations.*

G.3.2

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING DESIRABLE AND UNDESIRABLE PROPERTIES OF FEEDBACK PROVIDED TO THE LEARNER BY THE TRAINER

PROPERTIES	POSITIVE EASE OF COMPARING student-produced output and trainer-produced standard	NEGATIVE DIFFICULTY IN COMPARING student-produced output and trainer-produced standard
CRITERIA	*Discriminating between one's own product and the standard provided by the trainer is relatively easy* *··Similarity or dissimilarity between the two is relatively easy to discriminate* *··Properties of the standard output which are relevant are clearly identified* *··Comparison of student output and standard can be made objectively*	*-Discriminating between one's own product and the standard provided by the trainer is relatively difficult* *··Similarity or dissimilarity between the two is relatively difficult to discriminate* *··Properties of the standard output which are relevant are not clearly identified* *··Comparison of student output and standard requires subjectivity*
EXAMPLES	e.g., ENGLISH composition *-A paragraph with an "ideal" development sequence is presented as a standard* *-In addition, key features are underlined (e.g., transition words); commentary is added describing how ideas are developed in the paragraph* *-A checklist is also provided to assist the learner to look for key attributes in his own paragraph*	e.g., ENGLISH composition *-Only a paragraph with an "ideal" development sequence is presented as a standard* *-No clues are provided the learner to assist him in comparing his paragraph with the standard or to provide him with an identification of properties he should look for in his own*

G.3.2
IDENTIFICATION
MATRIX

CRITERIA FOR IDENTIFYING DESIRABLE AND UNDESIRABLE PROPERTIES OF FEEDBACK PRODUCED BY THE LEARNER HIMSELF

PROPERTIES	ABILITY of students to discriminate between acceptable and unacceptable outputs	INABILITY of students to discriminate between acceptable and unacceptable outputs
CRITERIA	-*Student can discriminate between correct and incorrect outputs (products)* -*Student can generalize over the range of acceptable and over the range of unacceptable outputs (products)* -*The capability is either due to prior learning or to a learning experience explicitly devised by the trainer for this purpose*	-*Student cannot discriminate between correct and incorrect outputs (products)* -*Student cannot generalize over the range of acceptable and over the range of unacceptable outputs (products)* -*The absence of the capability is due to either:* ••*No prior learning* ••*Failure of the trainer to provide an appropriate learner opportunity*
EXAMPLES	e.g., English composition -*Before practicing writing paragraphs (the requirement being to produce an orderly development of ideas), the student is given practice in discriminating between paragraphs which are and are not well developed*	e.g., English composition -*Before practicing writing paragraphs (the requirement being to produce an orderly development of ideas), the student is NOT given practice in discriminating between paragraphs which are and are not well developed* -*Nor has he previously learned how to do this*

JOB PROCEDURES

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G.3.2

IDENTIFICATION MATRIX

	CRITERIA FOR IDENTIFYING SITUATIONS IN WHICH THE TWO TYPES OF FEEDBACK ARE LIKELY TO BE REQUIRED	
TYPES OF FEEDBACK	When TRAINER- OR INSTRUCTOR-PRODUCED feedback is more likely to be required	When STUDENT-PRODUCED FEEDBACK is more likely to be required
CRITERIA	-*Criterion behavior involves a knowledge domain* -*A criterion behavior consisting of short chain (knowledge domain or performance)*	-*Criterion behavior involves performance* -*A criterion behavior consisting of long chain (knowledge domain or performance)* ••*The output for each part of the chain provides feedback as to the correctness of that part*
EXAMPLES	e.g., principles about classroom management -*The teacher trainee practices dealing verbally with examples of classroom problems or with principles about how to deal with them* -*The instructional materials provide a "correct" or "ideal" solution with which the trainee compares his own answer*	e.g., actual classroom management -*The teacher trainee practices managing problems in the classroom* -*The partial results (for parts of the chain) or the final results provide feedback as to correctness of the procedures used*

G.3.2

DECISION MATRIX

DETERMINING WHAT TO DO WHEN PLANNING THE DESIGN OF FEEDBACK

REQUIREMENTS	Feedback to be provided BY YOU	Feedback to be STUDENT-PRODUCED (AND students cannot already discriminate between outputs)
ACTION TO TAKE	-*Provide feedback for each practice problem given a student* -*Devise feedback which poses no problems for the student in discriminating between the standard and his own output or product*	-*When providing student opportunities to practice part of a chain (i.e., practice discriminating between or generalizing across INPUTS, or practice associating INPUTS and ACTIONS), have the student first practice discriminating between correct and incorrect OUTPUTS* -*When providing student opportunities to practice the whole chain (i.e., the sequence of sts), have the student first practice discriminating between a correct and incorrect final OUTPUT.*
EXAMPLES	e.g., SPELLING -*The student is required to practice spelling words* -*The correct spelling is provided after he practices spelling either* ..*Each word, OR* ..*A series of words* -*If there are error-prone spelling situations (e.g., omitted letters) attention might be called to the usual error by underlining the letter in feedback* ..*Ceiling*	e.g., CHEMISTRY EXPERIMENTS -*The student is required to combine materials resulting in a final product* -*Along the way he must be able to tell whether what he is producing is correct or not* -*Training is required in discriminating between what a correct and incorrect partial product looks like* (so that the student can determine whether to go on, make a correction, or start over)

G.3.2

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN DESIGNING FEEDBACK DELIVERY TO STUDENTS

#1

a. Review SECTION IB of FORM G.1(2) to determine whether feedback is likely to be:

- Trainer-produced
- Student-produced

#2

a. Plan the type of feedback to be provided the student

(See SECTION III of FORM G.1(2) for a checklist reminder)

SECTION IB OF FORM G.1(2)

Part of SECTION III OF FORM G.1(2)

PROVIDE FEEDBACK

Correctness of Answers (Solutions)
standard available for
comparison
discrimination practice
re: correct outputs

#2a

G.3.2

STANDARDS MATRIX

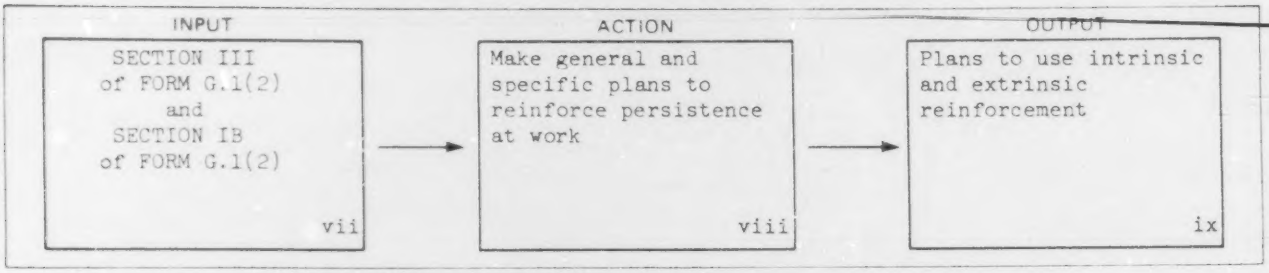
CRITERIA FOR ASSESSING THE ADEQUACY OF THE DESIGN OF FEEDBACK DELIVERY TO STUDENTS

PROPERTIES	COMPLETENESS	OBJECTIVITY
CRITERIA	-*Feedback is provided for each practice problem (of whatever size)* -*Feedback is provided for parts of a chain when practice involves only a part of the total criterion behavior*	*TRAINER-PRODUCED FEEDBACK* -*Discriminations between student output and a standard are made easy by:* ..*Identifying relevant attributes to attend to* ..*Providing additional defining information when there is likely to be dissimilarity or variation between student output and a standard* *STUDENT-PRODUCED FEEDBACK* -*Students are provided opportunities to practice discriminating between acceptable and unacceptable outputs*

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Plans to use intrinsic and/or extrinsic reinforcers to strengthen and maintain persistence at work, ie., practice of criterion behavior.*
WHAT YOU WILL WORK FROM	(1) Classification of behavior to be practiced (in section IB of FORM G.1(2).
WHAT YOU WILL DO	(1) Make plans for types and timing of reinforcement to be delivered.
FORMS YOU WILL USE	FORM G.1(2) -- section III -- column #2: "REINFORCE PRACTICE" -- which serves as a reminder of the need to plan to reinforce students for correct practice.

DESCRIPTION OF Sub-STEP	G.3.3



Job Aid Contents

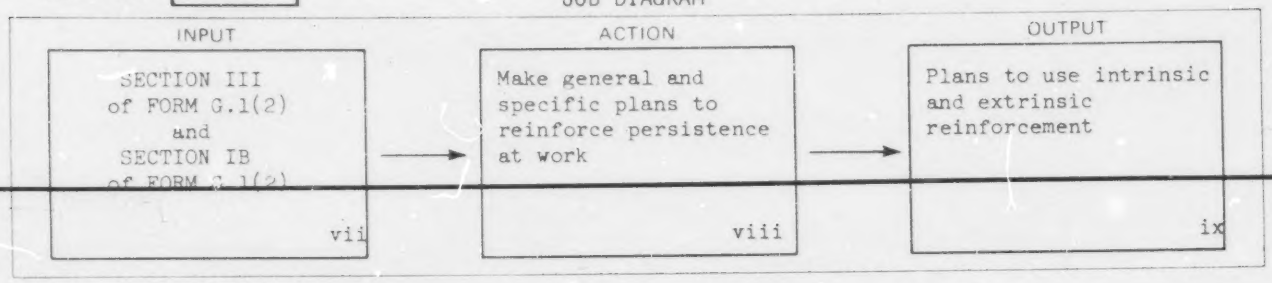
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Two types of reinforcers . . 208 -MATRIX: Goals of behavior control 207	-MATRIX: How to strengthen and to maintain persistence at work 209	-MATRIX: Adequacy of plans to reinforce persistence at work 213	SECTION III of FORM G.1(2) SUMMARY OF PROCEDURES . . . 212

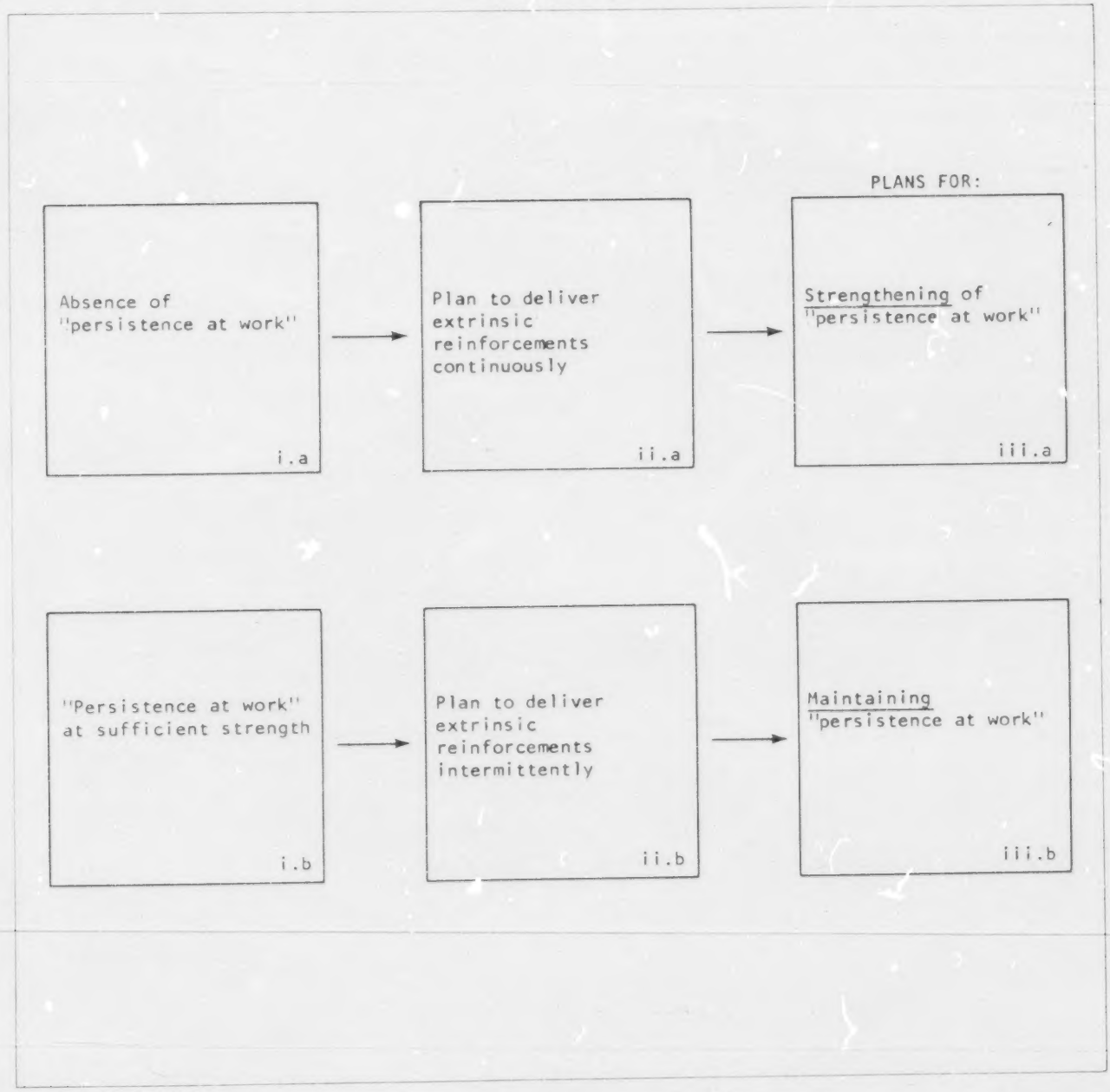
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		SECTION IB of FORM G.1(2) (carried forward from)	G.3.2	

Sub-STEP G.3.3

JOB DIAGRAM





BACKGROUND INFORMATION

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Two goals in controlling work (practice) behavior	207
Two types of reinforcers for strengthening and maintaining work behavior	208
How to strengthen and how to maintain work behavior	209

Form G-1(2)

LESSON ☐ CRITERION BEHAVIOR ☐

IA. Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
	INPUTS	INPUTS	INPUTS / OUTPUTS
☐ simultaneous	☐ 3 discriminations	☐ A similarity (dis-)	☐ I verbal/symbolic ☐ I
☐ aids available	☐ 4 generalizations	☐ B No. of properties	☐ II environmental ☐ II
☐ two directions	INPUTS & ACTIONS	☐ C No. of classes (or No. members/class)	☐ III audio ☐ III
☐ 1 transfer	☐ 5 associations	INPUTS & ACTIONS	☐ IV non-realistic ☐ IV
☐ 2 delayed basis	☐ 6 chains	☐ D existing associations	☐ V transient ☐ V
	ACTIONS	☐ E length of chain	ACTIONS
☐ recognition mode	☐ 7 generalizations	ACTIONS	☐ VI perceptual ☐ VIII vocal
	☐ partial proficiency	☐ F integrative strength	☐ VII motor ☐ IX sub-vocal

IIA. Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a. shaping gradual increases in quantity quality	b. R/E/P c. visual/verbal d. concrete/abstract e. procedures/principles	f. examples or demonstrations g. verbal cues h. visual cues i. diagramming, overviews	j. principles/procedures k. altered criterion/ criterion l. errors/criterion m. editing/criterion n. backward chaining	o. repetition p. review q. varied examples

		2	A	B	C	D	E	F	I	VI	VII
1	q	o-p	g	g				g-j	e	h	i
3	b-q	i-o-p	g-h-k	i-g	i					h	
4	b-q	i-o-p	g-h	i-g	i-g				g	h	i
3+4	b-i-q	i-o-p	g-h	i-g	i-g				c-d-e-i		
5	b-o	i-o-p			i-g-o-p	b-g-i					
6	a-f-m-n	o-p					a-n				a-m-n
7	i	o-p						g-h-j			i

III. Plan Behavior Control

PROMPT • OBSERVATION • ATTENTION	PROVIDE FEEDBACK	*REINFORCE PRACTICE	PROVIDE DELAYED REINFORCEMENT
Advance Organizers statement of objectives instructions	*Correctness of Answers (Solutions)* standard available for comparison discrimination practice re. correct outputs	*Intrinsic Reinforcers* interesting materials	*Extrinsic Reinforcers* social monetary activities
Cues visual or verbal formats, diagrams checklists		*Extrinsic Reinforcers* social monetary activities grades	

G.3.3

IDENTIFICATION MATRIX

	CRITERIA FOR IDENTIFYING TWO GOALS IN CONTROLLING STUDENT PRACTICE BEHAVIOR	
GOALS	STRENGTHENING of "persistence at work"	MAINTAINING strength of "persistence at work"
CRITERIA	-*Learning requires active practice* -*Students have to acquire the behavior of persisting at the required active practice*	-*Persistence at work is required throughout the total learning experience* -*Student's persistence must be maintained throughout this total experience*

G.3.3

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING TWO TYPES OF REINFORCERS

TYPES OF REINFORCERS	INTRINSIC reinforcers	EXTRINSIC reinforcers
CRITERIA	-*Learning activities in which the student engages are reinforcing to him because of:* ••*Subject matter content* ••*Learning tasks* -*Reinforcement is therefore provided as the student engages in the learning activities* -*Materials or activities are selected which are known to be reinforcing to students and are selected to strengthen or maintain persistence at work*	-*Reinforcement is delivered following the student's engaging in learning activities* -*The specific reinforcement provided is arbitrary, i.e., is not related to the learning activities it follows** ••*Social reinforcers* ••*Money* ••*Grades* -*Materials or activities are selected which are known to be reinforcing to students and are selected to strengthen or maintain persistence at work*
EXAMPLES	e.g., English vocabulary *The use of crossword puzzles or of word games as a means of providing instruction in vocabulary is an example of casting the learning task within the framework of activities known to be interesting to (and, therefore, reinforcing to) students*	e.g., English vocabulary *Vocabulary can be taught by conventional means. But, the student may be reinforced by extrinsic means--e.g., tokens or privileges for sticking to the task of learning vocabulary from flash cards (or any other learning method)*

*Its delivery is, however, contingent on the student's engaging in the learning activities.

G.3.3

DECISION MATRIX

DETERMINING HOW TO STRENGTHEN AND HOW TO MAINTAIN PERSISTENCE AT WORK

GOALS	STRENGTHENING of "persistence at work"	MAINTAINING strength of "persistence at work"
ACTION TO TAKE	-*Shape gradual increments in the duration for which students persist at work* -*Provide extrinsic reinforcements for each gradually longer duration* -*Provide reinforcement for <u>every</u> work period*	-*When "persistence at work" occurs for the desired duration, begin tapering off in the frequency with which reinforcement is delivered* ••*Gradually space out the occasions on which reinforcement is delivered*
EXAMPLES	<u>e.g., INCREMENT SCHEDULE</u> -*Students might be reinforced for the following increments in durations of persistence at work:* *1st - 5 minutes of work* *2nd - 10 minutes of work* *3rd - 15 minutes of work* *4th - 20 minutes of work* *5th - 25 minutes of work* -*Reinforcement is delivered for each duration successfully met*	<u>e.g., WITHDRAWAL SCHEDULE</u> -*At the end of the period devoted to <u>strengthening</u> persistence behavior, reinforcements are being delivered only at the end of the morning and at the end of the afternoon* -*Reinforcement delivery is then thinned out according to this schedule:* *1st: Once a day* *2nd: Once every other day* *3rd: Once every third day* -*Reinforcement is, however, continued indefinitely, but its delivery is intermittent*

JOB PROCEDURES

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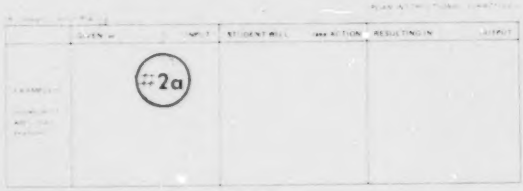
Adequacy of plans to reinforce "persistence at work"	213

G.3.3

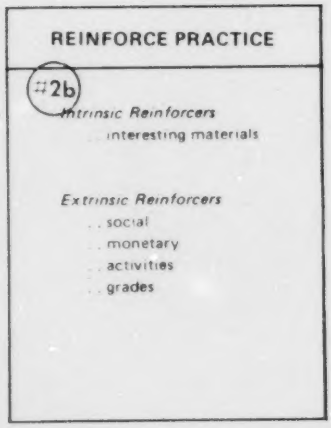
ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN PLANNING FOR THE REINFORCEMENT OF "PERSISTENCE AT WORK" DURING LEARNING

#1 GENERAL	#2 SPECIFIC to the Criterion Behavior:
a. Plan to provide reinforcement to strengthen and maintain "persistence at work" to cover practice required to learn each and every criterion behavior (i.e., throughout the course)	a. Review SECTION IB of FORM G.1(2) to determine whether: ••Content is or can be made interesting to students ••Tasks involving the content can be made interesting to students b. Plan to provide for reinforcement in one or both of the ways it can be provided (See SECTION III for a checklist reminder)

SECTION IB OF FORM G.1(2)



Part of SECTION III OF FORM G.1(2)



G.3.3

STANDARDS MATRIX

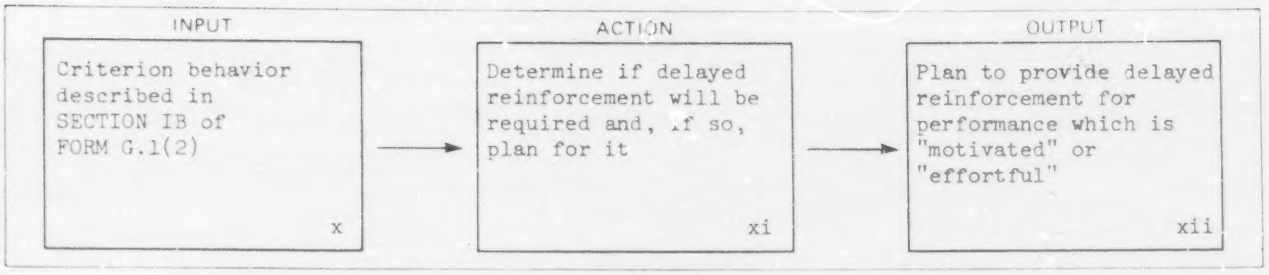
CRITERIA FOR ASSESSING THE ADEQUACY OF PROCEDURES INVOLVED IN PLANNING TO 'REINFORCE PRACTICE"

PROPERTIES	COMPLETENESS	EFFECTIVENESS
CRITERIA	-*Plans are made to:* ••*Strengthen "persistence at work"* ••*Maintain "persistence at work"* -*Plans are made:* ••*Generally to reinforce persistence at work throughout an entire course* ••*Specifically, to reinforce work at each criterion behavior*	-*Extrinsic reinforcers known to be effective for the target population are selected* *and/or* -*Plans are made to try out the selections to determine if they are in fact reinforcing* -*Similar plans are made for selection of intrinsic reinforcers*

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Plans to provide delayed reinforcement Post-training in order to maintain criterion behaviors which require motivation or are effortful.*
WHAT YOU WILL WORK FROM	(1) Classification of the criterion behavior to be exhibited after training or instruction is completed.
WHAT YOU WILL DO	(1) Determine whether the behavior requires motivation or effort to be exhibited. (2) Plan a provision of delayed reinforcement if criterion behavior requires it.
FORMS YOU WILL USE	FORM G.1(2) -- section iii -- column #4: "PROVIDE DELAYED REINFORCEMENT" -- which serves as a reminder to consider provisions of delayed reinforcement when necessary.

DESCRIPTION OF Sub-STEP	G.3.4


INPUT
Criterion behavior described in SECTION IB of FORM G.1(2)
x
ACTION
Determine if delayed reinforcement will be required and, if so, plan for it
xi
OUTPUT
Plan to provide delayed reinforcement for performance which is "motivated" or "effortful"
xii

Job Aid Contents

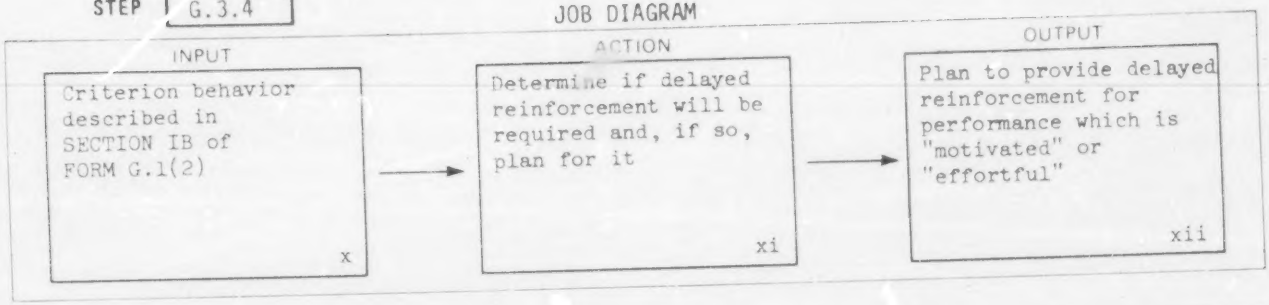
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Learning a skill vs. actively using it . . . . . 219 -MATRIX: Uses of reinforcement during vs. following instruction . . 220 -MATRIX: When reinforcement after instruction is likely to be necessary . . . 223		-MATRIX: Adequacy of plans to provide delayed reinforcement . 225	SECTION III of FORM G.1(2) SUMMARY OF PROCEDURES . . . 224

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		SECTION IB of FORM G.1(2) (carried forward from)	G.3.3	

STEP G.3.4

JOB DIAGRAM


INPUT
Criterion behavior described in SECTION IB of FORM G.1(2)
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OUTPUT
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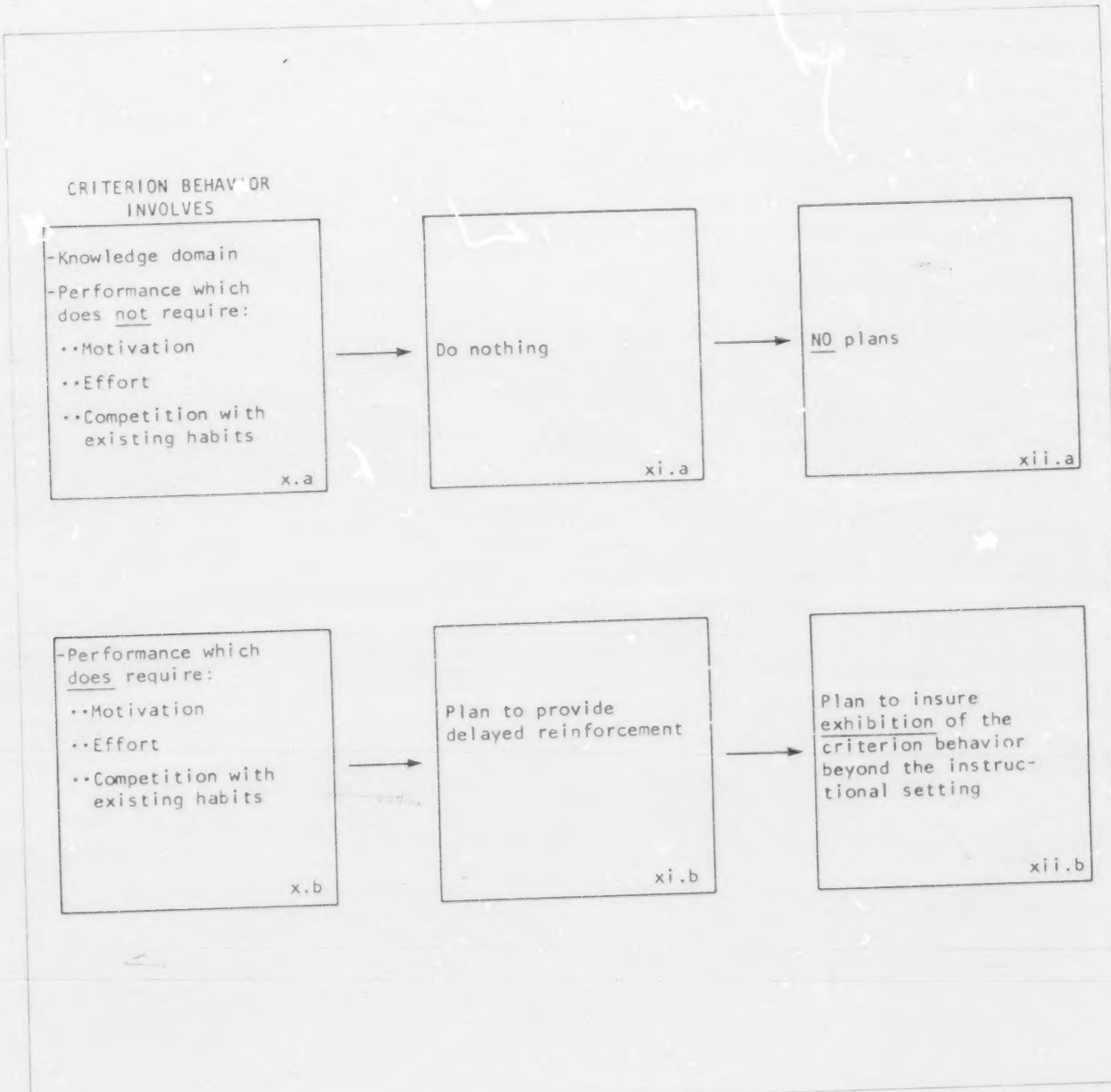
xii



BACKGROUND INFORMATION

	page
SECTION III of FORM G.1(2) as a checklist reminder to "PROVIDE DELAYED REINFORCEMENT"*	218
Distinction between learning skill and actually using it	219
Distinction between uses of reinforcement during and following training	220

From G 1(2)

LESSON [-] CRITERION BEHAVIOR [ ]

IA Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
[ ] simulation [ ] identification [ ] verbal directions [1] transfer [2] delayed basis [ ] recognition mode	INPUTS [3] discriminations [4] generalizations INPUTS & ACTIONS [5] associations [6] chains ACTIONS [7] generalizations [ ] partial proficiency	INPUTS [A] similarity (dis-) [B] No. of properties [C] No. of classes (or, No. members/class) INPUTS & ACTIONS [D] existing associations [E] length of chain ACTIONS [F] integrative strength	INPUTS / OUTPUTS [i] verbal/symbolic [i] [ii] environmental [ii] [iii] audio [iii] [iv] non-realistic [iv] [v] transient [v] ACTIONS [vi] perceptual [viii] vocal [vii] motor [ix] sub-vocal

IIA Select Preparatory Practice Progression(s)

UNIT SIZE	MODE	PROMPTING/FADING	CONTENT	FREQUENCY or VARIATION
a shaping/gradual increases in: quantity quality	b R/E/P c visual/verbal d concrete/abstract e procedures/principles	f examples or demonstrations g verbal cues h visual cues i diagramming, overviews	j principles/procedures k altered criterion/criterion l errors/criterion m editing/criterion n backward chaining	o repetition p review q varied examples

		2	A	B	C	D	E	F	i	vi	vii
1	a	o·p	g	g				g·i	e	h	i
3	b·a	i·o·p	g·h·k	i·g	i					h	
4	b·a	i·o·p	g·h	i·g	i·g				g	h	i
3+4	b·a	i·o·p	g·h	i·g	i·g				c·d·e		
5	b·o	i·o·p			i·g·o·p	b·g·i					
6	a·f·m·n	o·p					c·n				a·m·n
7	i	o·p						g·h·i			i

III Plan Behavior Control

PROMPT • OBSERVATION • ATTENTION	PROVIDE FEEDBACK	REINFORCE PRACTICE	*PROVIDE DELAYED REINFORCEMENT
Advance Organizers statement of objectives instructions *Cues* visual or verbal formats, diagrams examples	*Correctness of Answers (Solutions)* standard available for comparison discrimination practice re: correct outputs	*Intrinsic Reinforcers* interesting materials *Extrinsic Reinforcers* social monetary activities grades	*Extrinsic Reinforcers* social monetary activities

G.3.4

IDENTIFICATION MATRIX

DISTINCTION	LEARNING a skill	USING a skill
CRITERIA	-*The learner acquires all the skills necessary to perform or exhibit a given criterion behavior (i.e., he knows how to do it)*	-*The performer actually implements or uses the skill away from the instructional setting*
EXAMPLES	e.g., ORAL HYGIENE -*The student learns how to brush his teeth properly (i.e., up and down strokes)* e.g., STUDY HABITS -*The student learns to budget his time*	e.g., ORAL HYGIENE -*The student actually brushes his teeth the way he has learned (i.e., up and down strokes)* e.g., STUDY HABITS -*The student actually budgets his time in the way he learned to do it*

G.3.4

IDENTIFICATION MATRIX

CRITERIA FOR DISTINGUISHING BETWEEN GOALS OF REINFORCEMENT DELIVERED AT DIFFERENT TIMES

TIME OF REINFORCEMENT	DURING training or instruction	FOLLOWING completion of training or instruction
CRITERIA re: GOALS	-*The purpose of reinforcement delivered <u>during</u> instruction is to:* ••*Strengthen persistence at work* ••*Maintain persistence at work* -*Persistence at work is needed to make it possible for the learner to acquire a (any) criterion behavior*	-*The purpose of reinforcement delivered <u>following</u> instruction is to:* ••*Strengthen the exhibition of the criterion behavior learned during instruction* ••*Maintain the exhibition of the criterion behavior learned during instruction*
EXAMPLES	e.g., -*The learner is reinforced for doing exercises or solving problems during instruction* -*Practice in doing exercises or solving problems is necessary if the student is to acquire any criterion behavior*	e.g., -*The performer is reinforced beyond the instructional setting (e.g., on the job) for <u>exhibiting</u> the criterion behavior he has learned* ••*The teacher is reinforced for "reinforcing" her pupils rather than punishing them* ••*The production line worker is reinforced for doing something in the new way (rather than in the old way)*

JOB PROCEDURES

	page
Situations in which delayed (i.e., post-instructional) reinforcement for criterion behavior is likely to be necessary	223
SUMMARY OF PROCEDURES	224
Adequacy of plans for providing delayed reinforcement	225

G.3.4

IDENTIFICATION MATRIX

	CRITERIA FOR IDENTIFYING SITUATIONS IN WHICH DELAYED REINFORCEMENT IS LIKELY TO BE NECESSARY	
SITUATIONS	Delayed reinforcement IS likely to be required	Delayed reinforcement is NOT likely to be required
CRITERIA	*Criterion behavior involves:* *-Performance which meets one or more of the following criteria:* *··Can be described as requiring "motivation" to be exhibited* *··Requires (considerable) effort to be exhibited* *··Competes with an habitual and/or less effortful way to perform the same thing*	*Criterion behavior involves:* *-Knowledge domain* *-Performance which meets one or more of the following criteria:* *··Cannot be described as requiring "motivation" to be exhibited* *··Requires (little) effort* *··Does not compete with an habitual way to perform the same thing*
EXAMPLES	Performance requiring "MOTIVATION" e.g., *actually observing safety precautions on the job* e.g., *using good hygiene habits* Performance COMPETING with habitual patterns e.g., *speaking standard English when used to speaking non-standard English*	Knowledge domain e.g., *knowing how to observe safety precautions* Performance NOT requiring MOTIVATION/EFFORT e.g., *expanding a binomial theorem correctly* e.g., *mixing correct paints to achieve other colors (in art work)*

G.3.4

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN PLANNING WHETHER TO PROVIDE DELAYED REINFORCEMENT

#1

a. Review SECTION IB of FORM G.1(2) in order to determine whether criterion behavior requires delayed reinforcement

#2

a. If yes, consider possible types of delayed reinforcement listed in SECTION III of FORM G.1(2)

SECTION IB of FORM G.1(2)

#1a

SECTION III of FORM G.1(2)

PROVIDE DELAYED REINFORCEMENT

Extrinsic Reinforcers

#2a

G.3.4

STANDARDS MATRIX

CRITERIA FOR ASSESSING THE ADEQUACY OF PLANS FOR "PROVIDING DELAYED REINFORCEMENT"

PROPERTIES	RELEVANCE	EFFECTIVENESS
CRITERIA	-*Plans are made for providing delayed reinforcement only for criterion behaviors likely to require it; i.e., criterion behavior requires:* ••*Motivation* ••*Effort* ••*Competition with existing habits*	-*Extrinsic reinforcers known to be effective for the target population are selected* *and/or* -*Plans are made to try out the selections to determine if they are in fact reinforcing* -*Similar plans are made for selection of intrinsic reinforcers*

STEP G.3

COMPLETION CHECKLIST

		IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
G.3.1	Prompts for controlling student attention and observation				
G.3.2	Method of providing feedback to students				
G.3.3	Methods for reinforcing student for persistence at practice				
G.3.4	Methods for providing post-instructional reinforcement				

STEP G.4

G.4 Select media appropriate to the type of criterion and preparatory practice which has been designed.

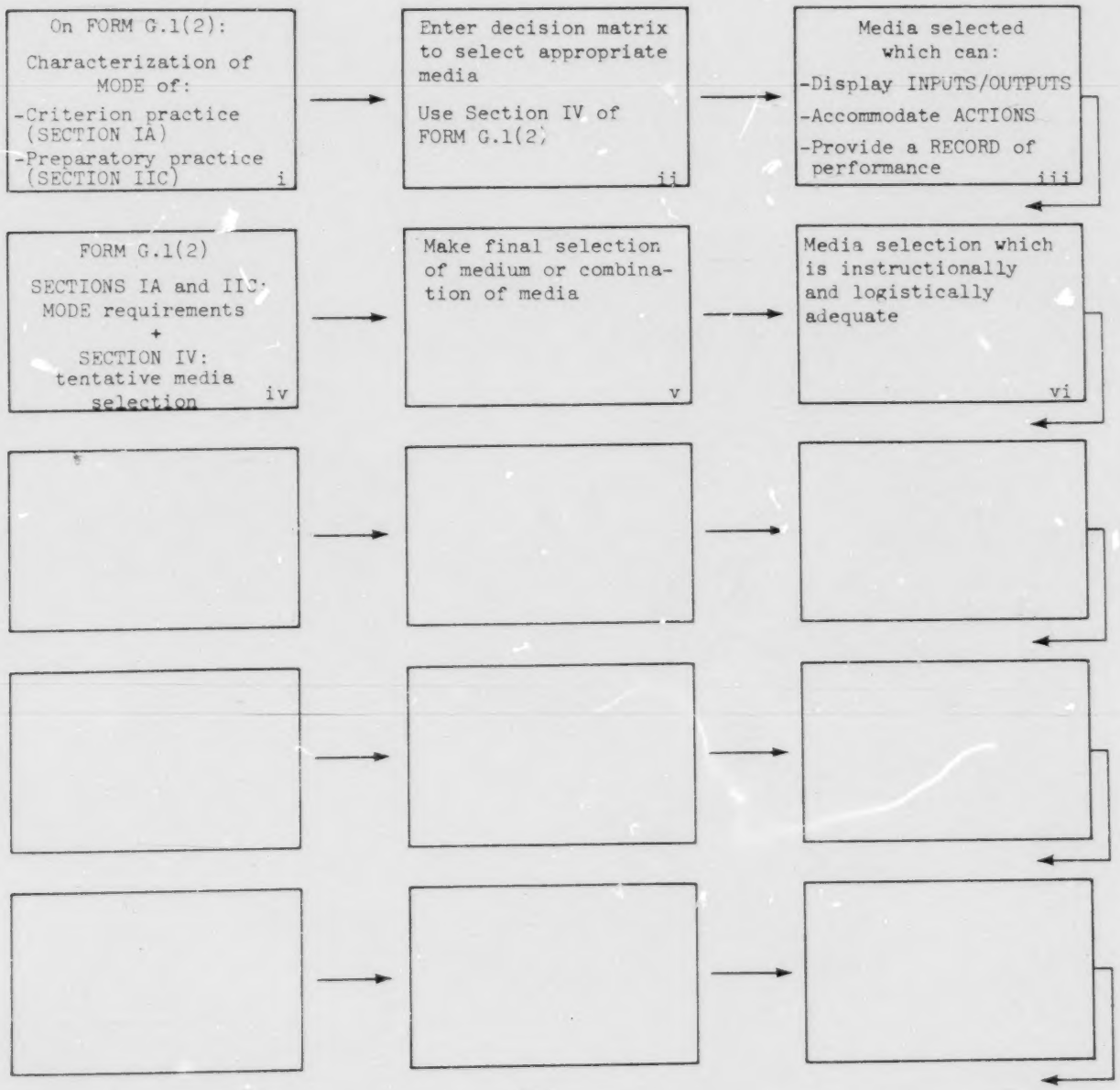
G.4.1 Identify media possibilities appropriate to mode requirements of criterion and preparatory practice.

G.4.2 Make medium (media) selection based on instructional and logistical considerations.

STEP G.4

OVERVIEW

INPUT	ACTION	OUTPUT
FORM G.1(2) ··SECTION IA (MODE) ··SECTION IIC (Characterization of MODE requirements)	Select media appropriate to mode Use Section IV of FORM G.1(2)	Selection of media capable of: -Displaying INPUTS/OUTPUTS -Allowing performance of ACTIONS -Providing a record of performance



STEP G.4

PAGE INDEX

	CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
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G.4.2	-MATRIX: Instructional and logistical factors to consider in selecting media . . 257-260	-MATRIX: Selecting media which are instructionally AND logistically adequate . . . 261	-MATRIX: Adequacy of final selection of media . . . 265	SUMMARY OF PROCEDURES . . 264

*SECTION IV OF FORM G.1(2)

(See opposite page)

Section IV of FORM G.1(2) is available as a decision matrix for selecting media.

IIB Design Criterion Practice

	GIVEN as INPUT	STUDENT WILL take ACTION	RESULTING IN OUTPUT
EXAMPLE(S) properties of additional examples			

IIB Design Preparatory Practice Progression

IIC Characterize

PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT	MODE
1st				INPUTS OUTPUTS i verbal/symbolic i ii environmental ii iii audio iii
2nd				iv non-realistic iv v transient v ACTIONS vi perceptual vii motor viii vocal ix subvocal
3rd				

* IV Select Media

INPUT/OUTPUT DISPLAY

r	print	s	environmental	t	devices
r.1	verbal	s.1	people (behavior)	t.1	film, TV
r.2	pictorial	s.2	objects	t.2	slides, projectors
		s.3	events	t.3	simulator
				t.4	audio-tape

INPUTS ▶ / OUTPUTS ▼	i verbal/symbolic		ii environmental		
	iii audio	visual	iii audio	visual: v transient	visual: non-v
iv non-realistic	t.4	r.1, r.2 r.1, t.2 t.3	t.4	t.1 t.3	t.2 t.3
v transient					
non-v	s.1		s.2 s.3	s.3	s.1 s.2

ACTION CAPABILITY / RECORD CAPABILITY

performance accommodation		record capabilities	
t.3	simulator	u.	paper and pencil
s.2	objects, equipment (manipulanda)	t.1	film, TV
		t.4	audio tape

OUTPUTS ▶ / ACTIONS ▼	i verbal/symbolic		ii environmental			
	iii	iv	iii	iv	v	non-v.
vi & ix	t.4	u		u		
vii		u	t.4	u	t.1	s.2 t.3
viii	t.4					

BACKGROUND INFORMATION
FOR ENTIRE STEP G.4

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Types of media capable of displaying INPUTS/OUTPUTS	238
Types of media capable of accommodating ACTIONS	239
Media that do and do not allow both INPUT/OUTPUT display and ACTION accommodation	240
Types of media capable of providing a record of performance	241

G.4

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING FOUR FUNCTIONS A MEDIUM MUST BE CAPABLE OF FULFILLING EITHER FOR CRITERION OR PREPARATORY PRACTICE
(See opposite page)

FUNCTIONS	1. DISPLAY of INPUTS	2. DISPLAY of OUTPUTS
CRITERIA	-*A medium must be capable of displaying or presenting:* ••*INPUTS in response to which the student is expected to take an action* ••*All relevant INPUT properties so that the student can take an appropriate action*	-*A medium must be capable of displaying or presenting:* ••*OUTPUTS that result from the action taken by the student (which provide feedback to the student)* ••*All relevant OUTPUT properties to provide complete and accurate feedback*
EXAMPLES	TYPES OF INPUTS TO BE DISPLAYED ••Print ••Pictures ••Symbols ••Sounds ••Objects ••People ••Events ••Behavior TYPES OF INPUT PROPERTIES TO BE DISPLAYED Physical ••Size ••Shape ••Color ••Time ••Distance ••Weight Symbolical ••Attitudes ••Feelings	TYPES OF OUTPUTS TO BE DISPLAYED ••Print ••Pictures ••Symbols ••Sounds ••Objects ••People ••Events ••Behavior TYPES OF OUTPUT PROPERTIES TO BE DISPLAYED Physical ••Size ••Shape ••Color ••Time ••Distance ••Weight Symbolical ••Attitudes ••Feelings

G.4

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING FOUR FUNCTIONS A MEDIUM MUST BE CAPABLE OF FULFILLING EITHER FOR CRITERION OR PREPARATORY PRACTICE
(See opposite page)

FUNCTIONS	3. ALLOW ACTIONS to be taken	4. Provide a RECORD of performance
CRITERIA	-*A medium, alone or with an adjunct medium, must allow the student to:* ••*Practice taking ACTIONS*	-*A medium, alone or with an adjunct medium, must be capable of:* ••*Providing a record of OUTPUTS produced so that the trainer or instructor can evaluate performance*
EXAMPLES	TYPES OF ACTIONS TO BE ACCOMMODATED ••*Motor actions*	TYPES OF RECORDS REQUIRED ••*Record of words, symbols, drawings* ••*Record of events* ••*Record of sounds* ••*Record of changes in objects, equipment* ••*Record of objects produced*

G.4

IDENTIFICATION MATRIX

THREE TYPES OF MEDIA CAPABLE OF DISPLAYING INPUTS OR OUTPUTS

TYPES OF MEDIA	PRINT	ENVIRONMENTAL	DEVICES
CRITERIA	-*Print media include:* ••*Books* ••*Charts* ••*Chalkboards* ••*Paper* -*Print media are used to display:* ••*Verbal INPUTS/OUTPUTS* ••*Pictorial INPUTS/OUTPUTS* ••*Symbolic INPUTS/OUTPUTS*	-*Environmental media include:* ••*People and their behavior* ••*Objects, equipment* ••*Events* -*Environmental media are used to provide a REALISTIC display of:* ••*Criterion INPUTS or OUTPUTS* ••*Preparatory INPUTS or OUTPUTS* *Which consist of people, objects, or events*	-*Device media include:* ••*Film, TV, animation* ••*Slides, projectors* ••*Simulators* ••*Audio tape* -*Device media are used to display:* ••*Same INPUTS/OUTPUTS as print media* ••*NON-REALISTIC version of INPUTS/OUTPUTS presented by environmental media*
EXAMPLES	e.g., paper *Architectural drawings are displayed on blueprints* e.g., books *Principles of physics or pictures of experiments are presented in print*	e.g., people's behavior *Actual student behavior in the classroom is the INPUT presented to the teacher trainee* e.g., objects *An actual radar configuration is presented to the trainee as an INPUT to be responded to*	e.g., film *An animated film presents an illustration of air passing above and below an airplane wing (Bernoulli's principle)* e.g., audio tape *Spoken French is presented as an INPUT to the language student by means of audio tape; the student's recorded response is the OUTPUT*

G.4

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING THREE TYPES OF MEDIA THAT ALLOW ACCOMMODATION OF ACTIONS

TYPES OF MEDIA	MANIPULANDA	SIMULATORS	PAPER AND PENCIL
CRITERIA	-*Media which allow the student to manipulate or make changes in actual INPUTS (resulting in an OUTPUT different from the INPUT)* ••*Objects* ••*Equipment and equipment components* *(i.e., primarily environmental display media)*	-*Media which allow the student to manipulate or make changes in simulated INPUTS (resulting in an OUTPUT different from the INPUT)* ••*Simulators*	-*Media which allow the student to produce verbal or symbolic OUTPUTS* ••*Paper and pencil* ••*Graphic, art materials*
EXAMPLES	e.g., computer *Student learning to use a computer actually practices using the computer, feeding actual cards into it or turning switches or knobs* e.g., lumber *Student learning carpentry uses actual lumber to build a chair*	e.g., space vehicle simulator *Student learning to land a space vehicle manipulates the controls of a simulated space vehicle*	e.g., English composition *Student learning to use correct punctuation writes in actual commas, periods, etc., on printed copy*

G.4

IDENTIFICATION **MATRIX**

CRITERIA FOR IDENTIFYING MEDIA WHICH DO AND WHICH DO NOT BOTH DISPLAY INPUTS/OUTPUTS AND ALSO ACCOMMODATE ACTIONS

TWO TYPES OF MEDIA	MEDIA which: display INPUTS/OUTPUTS and accommodate ACTIONS	MEDIA which: display INPUTS/OUTPUTS but require ADJUNCTS to accommodate ACTIONS
CRITERIA	-*Print* media can: ••Display verbal/symbolic/ pictorial INPUTS, AND ••Accommodate ACTIONS involving writing, drawing, etc., AND ••Display verbal/symbolic/ pictorial OUTPUTS (produced by student) -*Environmental* media can: ••Display objects/people, AND ••Accommodate manipulation of objects (or responses to people), AND ••Display changes in objects/ people -*Device* media (simulators and audio tape) can: ••Display verbal/symbolic/ environmental INPUTS, AND ••Accommodate ACTIONS, AND ••Display verbal/symbolic/ environmental OUTPUTS	-*Device* media (film, TV, slides, projectors) can only: ••Present or display INPUTS ••Present or display standardized OUTPUTS (not the OUTPUTS produced by the student himself) -*Device* media require adjuncts for accommodation of responses: ••Paper and pencil (for verbal/ symbolic/pictorial OUTPUTS produced by students) ••Environmental (for changes in objects required as OUTPUTS)
EXAMPLES	e.g., actual equipment -An actual automobile does all three: ••Displays the setting of the automatic gear shift (P, R, N, or D) AND ••Allows the student to manipulate the shift AND ••Displays the change in the setting (plus the effect on the car--e.g., motion forward vs. reverse	e.g., film -A film of an automobile interior only: ••Displays the setting of the automatic gear shift -It requires an adjunct to: ••Allow practice of the ACTION (shifting gears) ••Display the outcome (OUTPUT) -This could be simulated with paper and pencil or with a mock-up

G.4

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING MEDIA WHICH DO AND DO NOT PROVIDE A RECORD OF PERFORMANCE

TYPES OF MEDIA	Media which DO provide a record of performance	Media which do NOT provide a record of performance
CRITERIA	-*Media which display an actual OUTPUT produced by the student* ••*Print media* ••*Environmental media* ••*Device media (simulators, audio tape)* -*Generally, media which both have:* ••*INPUT/OUTPUT display capabilities* ••*ACTION accommodation capabilities*	-*Media which require adjuncts to accommodate actions and to display an OUTPUT* ••*Device media (film, TV, slides, projectors)*
EXAMPLES	*e.g., the drawings of an architectural student* *e.g., recorded voice of the student of French (on tape)* *e.g., the solution of a math problem on paper* *e.g., position of switches or knobs, etc., on simulated equipment*	*e.g., student responses to film, TV, or slide presented problems are usually recorded in notebooks (i.e., print media)*

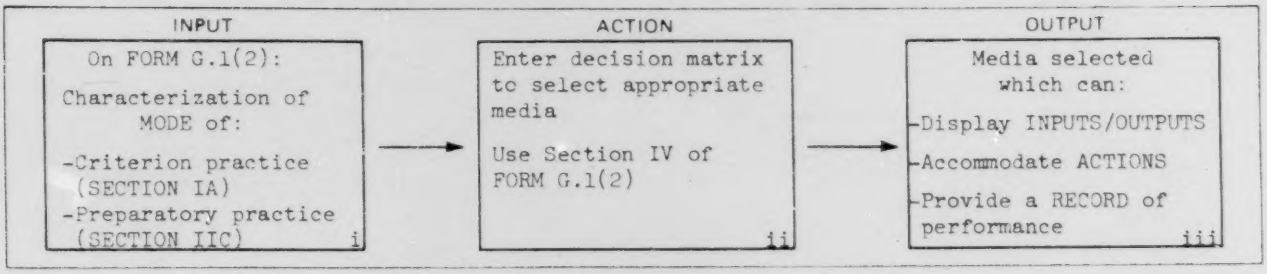
END OF:

BACKGROUND INFORMATION FOR ENTIRE STEP G.4

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Selection of one or more media which are appropriate to the mode requirements of behavior to be practiced.*
WHAT YOU WILL WORK FROM	(1) Classification of mode requirements of both criterion and preparatory practice behaviors (endorsements in sections IA and IIC of FORM G.1(2)).
WHAT YOU WILL DO	(1) Use endorsements to enter matrix and select appropriate media.
FORMS YOU WILL USE	FORM G.1(2) -- section IV -- a matrix to be used in identifying an appropriate range of media.

DESCRIPTION OF Sub-STEP	G.4.1



Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
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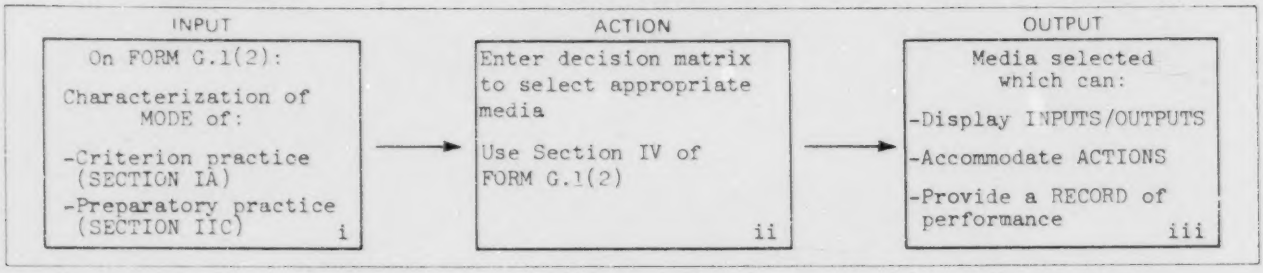
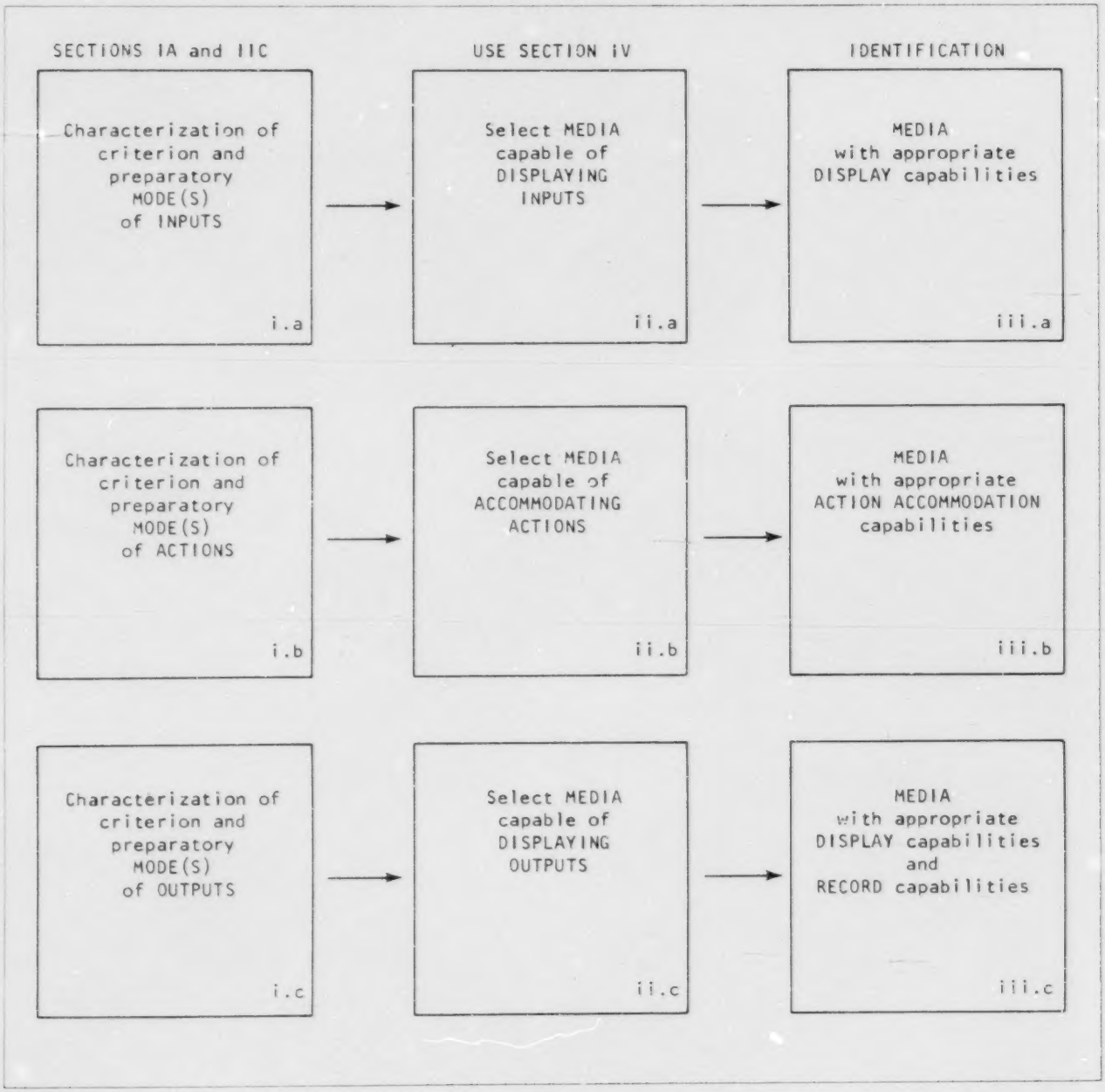
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		SECTIONS IA and IIC of FORM G.1(2) (carried forward from)	G.3.4	SECTION IV of FORM G.1(2)

Sub-STEP G.4.1

JOB DIAGRAM





BACKGROUND INFORMATION

	page
Where to get information that affects media requirements	246, 247
How to select media to meet requirements	248

G.4.1
DECISION
MATRIX

DETERMINING WHERE TO GET INFORMATION
THAT IDENTIFIES MEDIA REQUIREMENTS

TWO TYPES OF REQUIREMENTS	MODE of CRITERION practice	MODE of PREPARATORY practice
ACTION TO TAKE	*-From SECTION IA of FORM G.1(2):* *Identify the MODE of criterion behavior:* *··Mode of INPUTS to be displayed* *··Mode of ACTIONS to be accommodated* *··Mode of OUTPUTS to be displayed*	*-From SECTION IIC of FORM G.1(2):* *Identify the MODE of preparatory behavior:* *··Mode of INPUTS to be displayed* *··Mode of ACTIONS to be accommodated* *··Mode of OUTPUTS to be displayed*
EXAMPLES	See SECTION IA (MODE)* of FORM G.1(2) at TOP of opposite page	See SECTION IIC (MODE)** of FORM G.1(2) at BOTTOM of opposite page

G.4.1

ILLUSTRATION OF "MODE" SECTIONS OF FORM G.1(2)

EXAMPLE

SECTION IA of FORM G.1(2): CRITERION Mode Characterization

IA Characterize Criterion Practice Requirements

PERFORMANCE	LEARNING PROBLEMS	PROBLEM SOURCE	*MODE
☐ simulation ☐ aids available ☐ two directions 1 transfer 2 delayed basis ☐ recognition mode	INPUTS 3 discriminations 4 generalizations INPUTS & ACTIONS 5 associations 6 chains ACTIONS 7 generalizations ☐ partial proficiency	INPUTS A similarity (dis.) B No. of properties C No. of classes (or, No. members/class) INPUTS & ACTIONS D existing associations E length of chain ACTIONS F integrative strength	INPUTS / OUTPUTS I verbal/symbolic II environmental III audio IV non-realistic V transient ACTIONS VI perceptual VII motor VIII vocal IX sub-vocal

SECTION IIC of FORM G.1(2): PREPARATORY Mode Characterization

IIB Design Preparatory Practice Progression

IIC Characterize

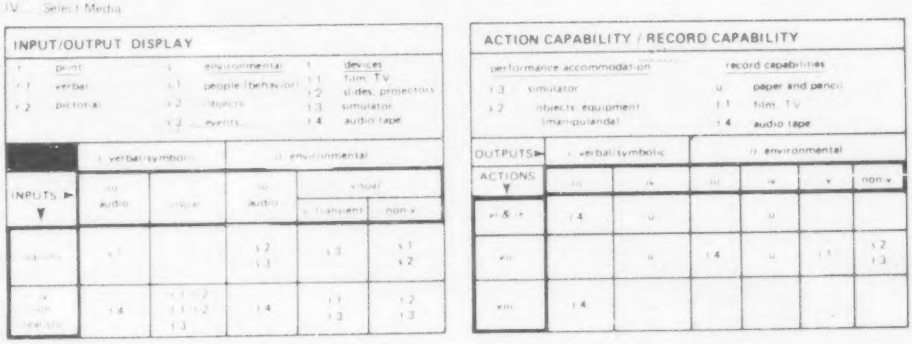
PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT	**MODE
1st	e.g., "All plurals use the verb 'are.'" Which of these nouns takes "are"? house houses	e.g., Checks the correct option	e.g., house X houses	INPUTS / OUTPUTS I verbal/symbolic II environmental III audio IV non-realistic V transient ACTIONS VI perceptual VII motor VIII vocal IX subvocal
2nd	e.g., Correct this sentence. "The men is at home."	e.g., Changes the incorrect verb or changes the noun	e.g., "The men are at home" OR "The man is at home"	
3rd	e.g., Write a sentence telling about what is happening in this picture. Use the correct form: "is" or "are."	e.g., Makes up a sentence	e.g., "Is" and/or "are" agree with the verb	

G.4.1
DECISION MATRIX

DETERMINING HOW TO MAKE SELECTION OF MEDIA FROM THE MATRIX: SECTION IV OF FORM G.1(2)

CONDITIONS	Need to DISPLAY: INPUTS/OUTPUTS	Need to ACCOMMODATE: ACTIONS Need to PROVIDE: A RECORD
ACTION TO TAKE	*-In the "DISPLAY" portion of SECTION IV, enter the matrix according to the MODE (Roman) numbers endorsed in SECTIONS IA and IIC* *-Circle the medium (media) in the appropriate cells* *-Do this for all criterion and preparatory endorsements*	*-In the "ACTION CAPABILITY/ RECORD CAPABILITY" portion of SECTION IV, enter the matrix according to the MODE (Roman) numbers endorsed in SECTIONS IA and IIC* *-Circle the medium (media) in the appropriate cells* *-Do this for all criterion and preparatory endorsements*

EXAMPLE



G.4.1

EXAMPLE

EXAMPLE ILLUSTRATING: (1) CHARACTERIZATION OF MODE OF CRITERION BEHAVIOR; (2) CHARACTERIZATION OF MODE OF PREPARATORY BEHAVIOR; AND (3) MEDIA SELECTION BASED ON (1) and (2)

1

IA. Characterize Criterion Practice Requirements

PERFORMANCE =	LEARNING PROBLEMS	PROBLEM SOURCE	MODE
☐ completion	INPUTS	INPUTS	INPUTS / OUTPUTS
☐ ☐ with variation	3 discriminations	A similarity (dist)	I verbal/symbolic I
☐ ✓ two directions	4 generalizations	B No. of properties	II environmental II
☐ transfer	INPUTS & ACTIONS	C No. of classes (or No. members/class)	III audio III
☐ delayed basis	5 associations	INPUTS & ACTIONS	IV non-realistic IV
☐ recognition mode	6 chains	D existing associations	V transient V
	ACTIONS	E length of chain	ACTIONS
	7 generalizations	ACTIONS	VI perceptual VII vocal
	☐ partial proficiency	F integrative strength	VIII motor IX sub-vocal

2

IIB. Design Preparatory Practice Progression

IIC. Characterize

PROGRESSION	given as INPUT	student will take ACTION	resulting in OUTPUT	MODE
1st				INPUTS / OUTPUTS: I verbal/symbolic I; II environmental II; III audio III; IV non-realistic IV; V transient V; ACTIONS: VI perceptual; VII motor; VIII vocal; IX subvocal
2nd				
3rd				

3

IV. Select Media

INPUT/OUTPUT DISPLAY

i print	s environmental	t devices			
i.1 verbal	s.1 people (behavior)	t.1 film, TV			
i.2 pictorial	s.2 objects	t.2 slides, projectors			
	s.3 events	t.3 simulator			
		t.4 audio tape			

I verbal/symbolic		II environmental			
INPUTS ▶ ▼	III audio	visual	III audio	visual: V transient	visual: non-V
transient	s.1		s.2 s.3	s.3	s.1 s.2
V non-realistic	t.4	i.1 i.2 i.3	t.4	t.1 t.3	t.2 t.3

ACTION CAPABILITY / RECORD CAPABILITY

performance accommodation	record capabilities
t.3 simulator	v paper and pencil
s.2 objects, equipment (manipulanda)	t.1 film, TV
	t.4 audio tape

OUTPUTS ▶	I verbal/symbolic		II environmental			
ACTIONS ▼	III	IV	III	IV	V	non-V
VI & IX	t.4			v		
VII		v	t.4	v	t.1	s.2 t.3
VIII	t.4					

JOB PROCEDURES

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Adequacy of selection of media	253

G.4.1 ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN SELECTING MEDIA

#1 INPUT/OUTPUT DISPLAY

a. In SECTIONS IA and IIC identify the mode(s) of INPUTS endorsed

b. In SECTION IV (DISPLAY portion) enter the matrix (by row AND column) according to Roman numbers identified in (a) above

c. Circle appropriate number/letter combination(s)

d. Repeat for OUTPUTS if different from INPUTS in (a) above

#2 ACTION ACCOMMODATION

a. In SECTIONS IA and IIC identify the mode(s) OF ACTIONS endorsed

b. In SECTION IV (ACTION portion and OUTPUT portion) enter the matrix (by row AND column) according to Roman numbers identified in (a) above and in #1(d) to the left

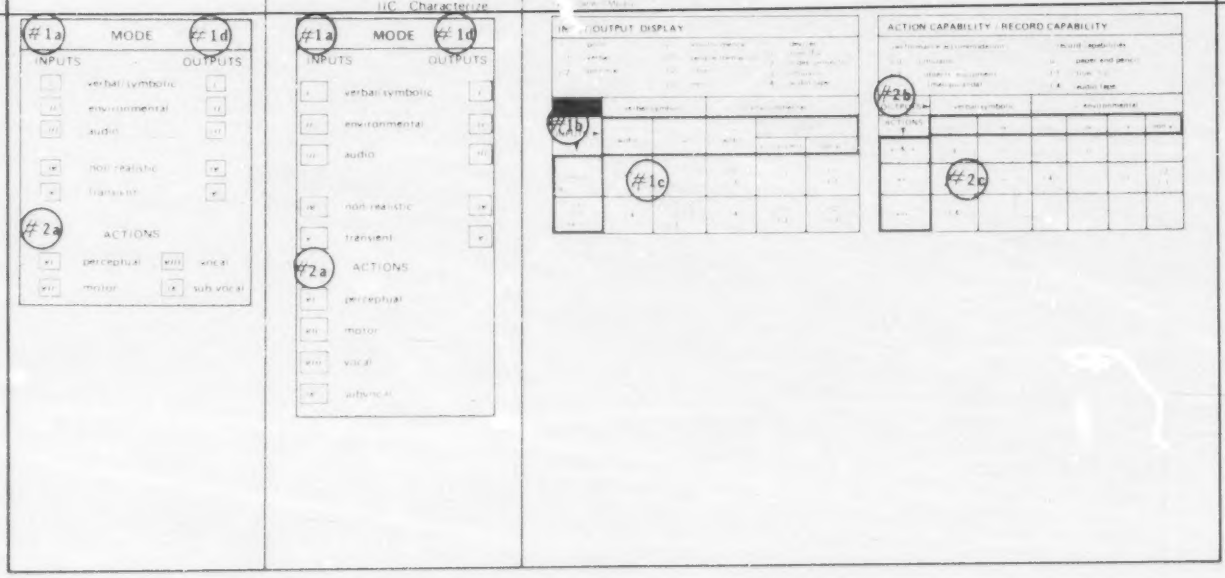
c. Circle appropriate number/letter combination(s)

#3 A RECORD

a. Review selections #1c and #2c in SECTION IV of FORM G.1(2) for their capability of providing a record of performance

b. Select adjunct media to provide a record for evaluation purposes (when necessary)

SECTION IA | SECTION IIC | SECTION IV



G.4.1

STANDARDS MATRIX

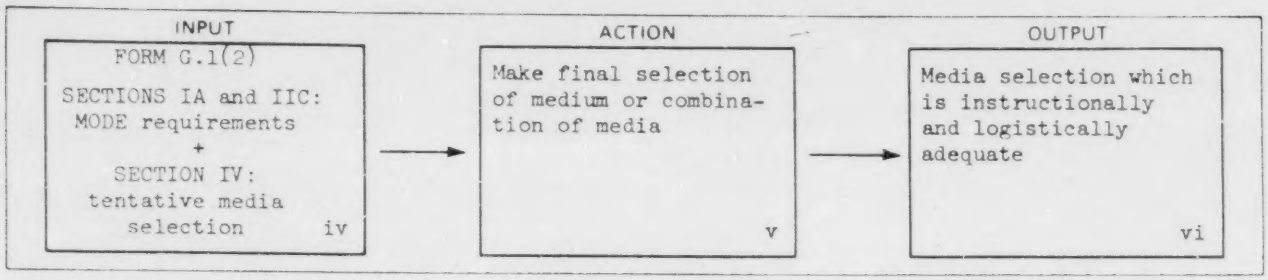
CRITERIA FOR EVALUATING THE ADEQUACY OF "MEDIA SELECTION"

PROPERTIES	RELEVANCE	COMPLETENESS I	COMPLETENESS II
CRITERIA	-*Entry into media selection matrix accurately reflects:* ••*MODE endorsements in Section IA (Criterion Practice)* *and/or* ••*MODE endorsements in Section IIC (Preparatory Practice)* -*Entry into media selection matrix accurately reflects:* ••*All the endorsements:* *For - INPUTS/OUTPUTS* *i verbal/symbolic* *ii environmental* *iii audio* *PLUS* *iv non-realistic* *v transient* *For - ACTIONS* *vi perceptual* *vii motor* *viii vocal* *ix sub-vocal*	-*Endorsements are made for all four media functions:* ••*Display of INPUTS* ••*Display of OUTPUTS* ••*ACTION accommodation* ••*Record capability*	-*There are as many endorsements of media as there are MODE endorsements to be accommodated*

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A medium (or media) selected capable of meeting mode requirements and which meets both instructional and logistical standards.*
WHAT YOU WILL WORK FROM	(1) Mode requirements of criterion and preparatory behaviors. (2) Media tentatively selected to accommodate these requirements.
WHAT YOU WILL DO	(1) Consider both instructional and logistical advantages of each tentatively selected medium. (2) Select one (or more) medium which is both instructionally and logistically adequate.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	G.4.2



Job Aid Contents

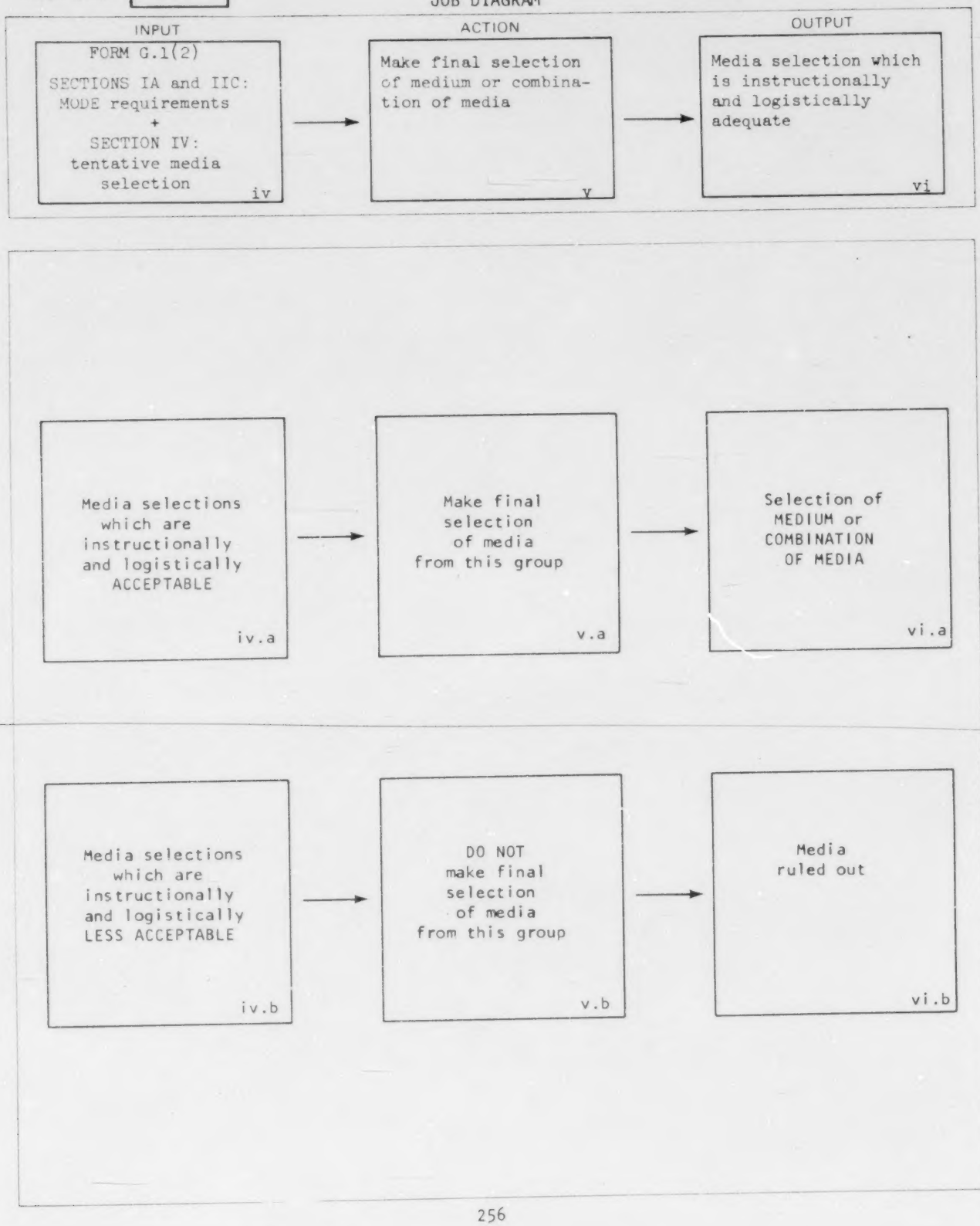
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Instructional and logistical factors to consider in selecting media . . . 257-260	-MATRIX: Selecting media which are instructionally AND logistically adequate 261	-MATRIX: Adequacy of final selection of media . . . 265	SUMMARY OF PROCEDURES . . 264

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
		~~FORM G.1(2) (carried~~ forward from)	G.4.1	

Sub-STEP G.4.2

JOB DIAGRAM



BACKGROUND INFORMATION

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Adequacy of media utilization	258
Media capabilities and cost of using them	259
Logistical considerations involved in using "environmental" media	260
How to make final decision from among media possibilities	261

G.4.2

IDENTIFICATION MATRIX

	CRITERIA FOR DETERMINING THE ADEQUACY OF MEDIA UTILIZATION	
UTILIZATION CONDITIONS	OVERutilization of MEDIA capabilities	UNDERutilization of MEDIA capabilities
CRITERIA	-*Attempting to meet MODE requirements by using media which:* ••*Are unsuited to the mode requirements* ••*Are not fully capable of meeting the mode requirements*	-*Attempting to meet MODE requirements by using media which:* ••*Have capabilities greater than those needed to meet the mode requirements*
EXAMPLES	e.g., media not possessing adequate display capabilities -*The INPUTS to be displayed are "moving vehicles" which the driver trainee has to respond to* -*The ideal medium is one which can meet the mode requirements (ii) environmental and (v) transient* -*Film or TV seem suited for this purpose* -*An attempt to use a succession of still slides presented in succession would be an example of the overutilization of a medium*	e.g., media possessing greater display capabilities than are required -*The INPUTS to be displayed are different classes of levers (with the fulcrum in different to effort force and resistance force)* -*Printed pictures or slides are adequate for this task* -*To use film or TV for the purpose would be an underutilization of these media*

G.4.2

IDENTIFICATION MATRIX

RELATIONSHIP BETWEEN MEDIA CAPABILITIES AND COSTING

RELATIONSHIPS	LESS complex capabilities and LOWER costs	MORE complex capabilities and HIGHER costs
CRITERIA	-*The fewer capabilities a medium has, the less costly its utilization will be*	-*The more capabilities a medium has, the more costly its utilization will be*
EXAMPLES	-*Print* ..*Verbal* ..*Pictorial*	-*Devices (in ascending order of cost)* ..*Slides, projectors* ..*Audio tape* ..*Film, TV* ..*Simulators*

G.4.2

IDENTIFICATION MATRIX

CRITERIA FOR DETERMINING WHETHER LOGISTICAL FACTORS MAKE SIMULATION OF CRITERION INPUTS, ACTIONS, OR OUTPUTS DESIRABLE

FACTORS TO CONSIDER	DOWNTIME	COST	DAMAGE/DANGER
CRITERIA	*Use of criterion inputs, actions, or outputs in training or in testing would result in:* *-Unavailability for regular operations of:* *··Personnel* *··Equipment, objects* *··Space* *··Resources (e.g., utilities)*	*Use of criterion inputs, actions, or outputs in training or in testing would result in:* *-High costs due to use or expenditure of:* *··Personnel* *··Equipment, objects* *··Space* *··Resources, materials*	*Use of criterion inputs, actions, or outputs in training or in testing would result in:* *-Physical danger or damage to:* *··People* *··Equipment, objects* *··Locations* *··Resources* *-Psychological danger or damage to:* *··People*
EXAMPLES	During PREPARATORY PRACTICE *e.g., if an actual office staff were used during training of a manager, there might be little or no productivity of the staff during that period*	During PREPARATORY PRACTICE *e.g., if students (psychology, biology) who were not yet fully trained were to use experimental animals (and use them up), this might result in needlessly high training costs*	During PREPARATORY PRACTICE *e.g., if an actual patient were used during the preparatory training of a medical student (before he had fully learned how to perform surgery), this might result in harm to the patient*

*These are the same considerations involved in the decision to simulate (See TASK "E"). Simulation decisions in Task E covered criterion behavior. Here, they will concern the preparatory practice behaviors you have designed.

G.4.2

DECISION MATRIX

DETERMINING THE FINAL SELECTION OF A MEDIUM OR COMBINATION OR MEDIA BASED BOTH ON INSTRUCTIONAL AND LOGISTICAL CONSIDERATIONS

CONDITIONS	1	PLUS 2
	A number of media have been identified as suitable	Based on the selection (made in Column 1) a number of possibilities still remain
ACTION TO TAKE	-*Make a selection from among the possibilities which meets all the requirements:* ••*Can DISPLAY relevant INPUTS/ OUTPUTS* ••*Can ACCOMMODATE relevant ACTIONS* ••*Can PROVIDE a necessary RECORD of performance* -*Make a selection resulting in <u>one</u> of the following:* ••*A single medium can meet all requirements* ••*A combination of media can meet all requirements*	-*Select from among the possibilities the one which is the least expensive* ••*Select the least complicated medium (or media) capable of meeting instructional requirements* *(See Volume E on SIMULATION for ways to resolve differing instructional and logistical requirements)*
EXAMPLES		<u>e.g., BOTANY</u> -*The medium must be capable of displaying leaves and accommodating written responses* -*Film has both the display and action capabilities with paper-and-pencil adjuncts* -*However, slides or printed pictures (with paper-and-pencil adjuncts) can do the same job at less cost*

JOB PROCEDURES

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Adequacy of final selection of media	265

G.4.2

ILLUSTRATION SUMMARIZING PROCEDURES INVOLVED IN MAKING FINAL SELECTION OF A MEDIUM OR COMBINATION OF MEDIA

#1

REVIEW on FORM G.1(2)

a. Tentative media selections made (circled in SECTION IV)

b. MODE requirements endorsed in SECTION IA

c. MODE requirements endorsed in SECTION IIC

#2

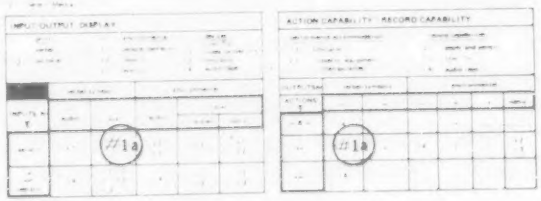
a. From the tentative list make a selection which neither overutilizes nor underutilizes a medium (media)

b. Narrow down the selection to the most cost-effective medium or media (i.e., least costly) and logistically acceptable)

c. Make certain all media functions can be fulfilled:

- ··Display of INPUTS/OUTPUTS
- ··ACTION accommodation
- ··A RECORD of performance

SECTION IV of FORM G.1(2)



SECTIONS IA and IIC of FORM G.1(2)

G.4.1

STANDARDS MATRIX

CRITERIA FOR ASSESSING ADEQUACY OF SELECTION OF A MEDIUM OR COMBINATION OF MEDIA

PROPERTIES	INSTRUCTIONAL ADEQUACY	LOGISTICAL ADEQUACY
CRITERIA	-*The medium or combination of media is capable of adequately:* ••*Displaying INPUTS/OUTPUTS* ••*Accommodating ACTIONS* ••*Providing a RECORD* -*The medium or combination of media represents:* ••*Neither an overutilization* (See above)* ••*Nor an underutilization*	-*In the case of PRINT and DEVICE media, the selection from among those that are instructionally adequate is also:* ••*Cost-effective* -*In the case of ENVIRONMENTAL media, the selection does NOT violate logistical considerations of:* ••*Cost* ••*Downtime* ••*Danger/damage*

STEP G.4

COMPLETION CHECKLIST

		IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
G.4.1	Media possibilities appropriate to mode(s) of criterion and preparatory practice				
G.4.2	Medium (media) to be used based both on logistical and instructional considerations				